FEBRUARY 1954

APPLIED HYDRAULICS

THE MAGAZINE OF FLUID POWER TRANSMISSION

INCLUDING AIR CONTROLS AND AIR CIRCUIT DESIGN; ELECTRICAL CONTROLS

COMBINING AIR AND OIL CIRCUITS PAGE 38

SIMPLIFIED VALVING FOR HYDRAULIC PRESSES PAGE 37

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AVIATION SECTION PAGE 53

Listed on page 2 you'll find 9 articles and 8 regular departments which feature applications and design ideas for fluid power equipment

When you want help in a hurry—

CALL YOUR HANSEN REPRESENTATIVE

CHARLES WEBER, JR.
Charles Weber Co., Louisville, Ky.

Offers engineering help on fluid line installations and accessory equipment to firms in rapidly growing industrial areas of Kentucky, Tennessee and Arkansas.

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Clem W. Weston, New Orleans, La.

Provides industrial plants in Louisiana and Mississippi with practical know-how and assistance on pneumatic and hydraulic problems — including fluid line circuits for original equipment applications.

Quick-Connective Couplings are his business —but so are Fluid Line Problems

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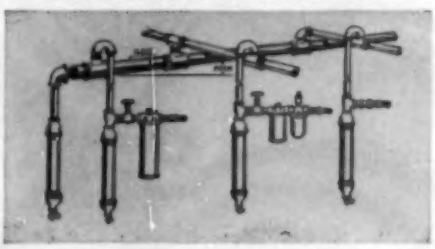
The main job of the Hansen representative, of course, is to supply you with exactly the right couplings specifically designed and constructed for the requirements of your particular application.

But from years of on-the-job experience with almost every type of fluid line installation, he can also give you real help on such matters as the pitch of your lines, proper take-off, location of drains and other details which insure a moisture-free circuit operating at maximum efficiency.

To keep moisture out of air operated devices—
ASK THE HANSEN REPRESENTATIVE ABOUT THE HANSEN HOOK-UP



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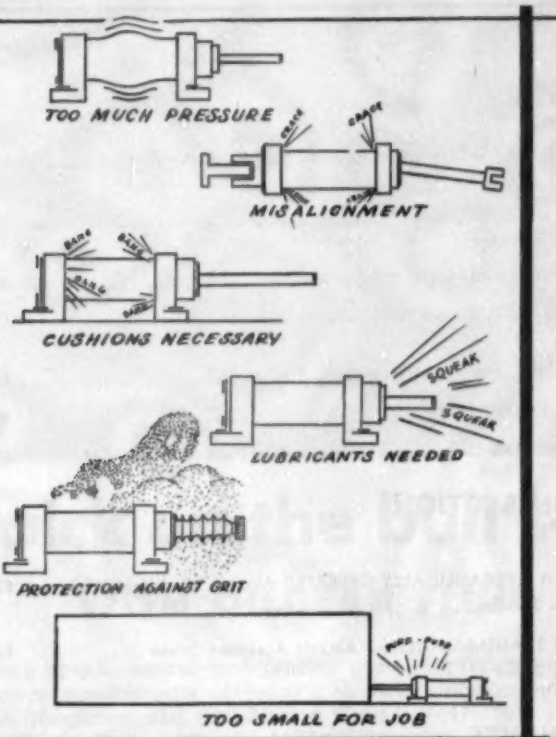
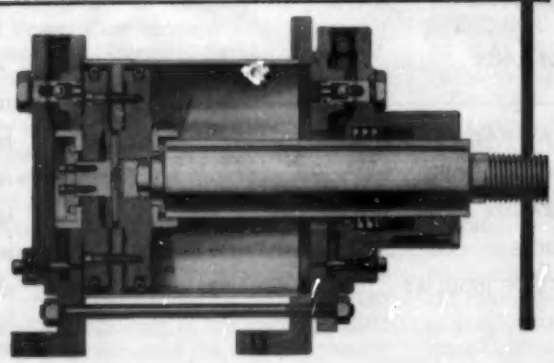
How your CYLINDERS can Last Longer





WHEN YOU INSTALL an air cylinder you want to insure the long life and trouble-free performance for which the cylinder was designed. Cylinders of ample capacity for the job should be used . . . Operating pressure should not exceed maximum cylinder rating. Trouble is often caused by use of the improper cylinder mounting style and by the piston rod being incorrectly aligned with the load to be pushed or pulled. Where the atmosphere contains moisture or abrasive dust, piston rod protective boots are desirable. Speed control valves in the air line may be necessary, particularly in moving high inertia anti-friction loads horizontally. Standard cushions, or even "super" cushions may be needed. Filters and lubricators are desirable.

WHEN YOU INSTALL a HANNA® Air Cylinder you have the *best* assurance of long cylinder life . . . you have consistently efficient performance . . . you have minimum maintenance. Hanna Cylinders combine such important features as removable bronze check valves, piston-packing expander rings, floating bronze cushion sleeves, self-adjusting, spring-backed rod packings and two-piece threaded flange and head construction.

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U.S. Army Photograph

Quick on the bull's-eye and stay there

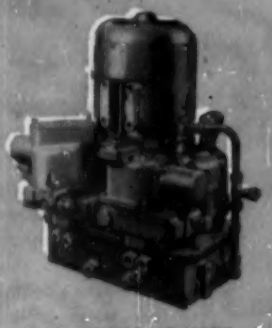
WITH OILGEAR FLUID POWER

Meeting speed, control and precise performance requirements of today's U. S. Tanks, Howitzers and Anti-Aircraft Guns is a "Natural" for Oilgear ANY-SPEED Fluid Power Components.

Gunners in Sherman, Pershing and Patton tanks experienced the advantages of rapid fluid power slewing and precise fluid power tracking of the turret and gun 360° in either direction. They appreciated the value of Oilgear fluid power that obeyed a light twist of the wrist. Likewise, those manning America's most effective 40 mm anti-aircraft guns, recognized the importance of automatic, self-synchronizing Oilgear fluid power drives for rapid slewing and precise tracking of the carriage 360° in either direction and the rapid, accurate elevating and depressing of the gun for quick homing on the target and following it.

Therefore, when today's new combat vehicles with far greater fire power and accuracy were planned, Oilgear ANY-SPEED Fluid Power Drives were a "Natural" for both turret traverse and gun elevation. They met the demands for accurate control over speed ranges up to 4000:1. They provided unbelievably low tracking speeds under precise response without overrun or drift. They stayed on the target for repetitive shots. No wonder, one men's magazine calls the new Oilgear equipped M47 "the sharpest shooting tank anywhere today." That's why Oilgear ANY-SPEED fluid power drives are a "Natural" on the wide variety of U. S. combat vehicles.

Don't you think it is time for you to look with wide open eyes at Oilgear Fluid Power Pumps, Motors and Transmissions for your machines... to better the performance of an already good machine? To solve a seemingly "impossible" design problem? To synchronize machine units easily and economically? To weed out trouble and cut maintenance and down time to a surprisingly low level? Counsel with an Oilgear Engineering Representative will cost you nothing, may benefit you greatly. THE OILGEAR COMPANY, 1564 W. Pierce St., Milwaukee 4, Wisconsin.



OILGEAR POWER PACK
Self-contained unit used in present day tanks and howitzers. Consists of electric drive motor, two Oilgear two-way variable delivery pumps (or generators), oil reservoir and integral closed system controls for turret traverse and gun elevation. Supplies fluid power to Oilgear hydraulic drive motors.

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PIONEERS ... NOW THIRTY YEARS AHEAD FOR FLUID POWER

PUMPS, MOTORS, TRANSMISSIONS, CYLINDERS & VALVES

APPLIED HYDRAULICS

Fluid Power Lines

Get Your 1954 Prize Paper Contest Entry Blank

Don't put off entering the 1954 APPLIED HYDRAULICS Prize Paper Contest. The contest offers you a way to earn some extra money—$1200 in prizes are offered. A published paper also offers prestige and a great deal of experience.

Anyone in the fluid power field may enter a paper. The paper may describe a product or machine design, production equipment, maintenance methods, a research project, etc. And remember, if your paper makes a good article it will be published and paid for at regular rates even if it is not awarded one of the seven prizes—so you can't lose.

To enter, the contest you need an entry blank. Write us. We'll send the blank and suggestions for preparing your paper. The contest closes June 1st.

The Strong Link

A hydraulic system needs strong links in the form of fittings, pipe, tube and hose. Because most service problems require removal, repair or replacement of the fluid carriers, selection of these parts should not be slighted. No customer will put up with a hydraulic system that leaks badly and requires constant repair. He doesn't have to, if the fluid carriers are properly selected and installed on the machine.

To give you data on fluid carriers, this issue includes an article by J. E. Jass of the Caterpillar Tractor Company. The article is based on a paper presented by Mr. Jass at the National Conference on Industrial Hydraulics.

Bigger and Bigger

With a new oil hydraulic pump used on a tube reducing machine, 3000 psi pressure can be developed while delivering 2300 gpm. That's a lot of horsepower. More than any one single oil hydraulic pump has ever produced. The design of the circuit and the machine which uses this pump is described in this issue. What new designs will this new pump make possible?

Reprints of the 32 page circuit section which appeared in January are available. Single copies 50c; 40c in lots over 50; 35c in lots over 100 copies.

Machine Development

In this month's lead article, Leroy Conklin tells about the development of fluid power circuits in Taylor-Winfield's resistance seam welders since 1939. Circuits for the three stages of development are shown. Both air and oil circuits are used on these machines.

If machine design is your field, you'll find Mr. Conklin's article interesting and valuable. He tells about the requirements which led to the selection of components in each design. Each new design takes advantage of new piping techniques, new concepts in machine layout and uses new components. The designs illustrate the work of designers who keep abreast with techniques and equipment.

Simplified Valving

In this issue, Lou Zimmerman, of Clearing Machine, shows the design of the valving used on many Clearing presses. Reliability, long life, freedom from leakage and reduced pressure fluctuations are some of the reasons why Clearing has combined valving into a compact package.

Special Designs

Many applications call for the development of special purpose valves and actuators. These components have very little application except for the one job for which they were built. However, to a designer, knowledge of these special products offers ideas for other uses, and ideas for other designs. This is particularly true of special hydraulic valves, because the design of fluid power parts is based on general principles which have wide application.

Our never satisfied curiosity is enough to make us want to look inside a machine. Yours probably is too. That's how we feel about C. R. Sacchini's article in the Aviation Section this month. He describes the design of a hydraulically operated windshield wiper for aircraft. This design solved problems of space, shock, reliability and producibility. It is also a rather ingenious mechanism.

14 "Floating" Precision "O" Rings make this impact wrench work!

This rugged Impact Wrench is compact and efficient because it uses *Precision* Floating "O" Ring Seals. Master Pneumatic Tool Company of Orwell, Ohio, used a new design principle (U. S. Patent No. 2,647,810). The Sealing Assembly is designed so that the "O" Rings float in the grooves, pressing outward against cylinder walls. There is no cross sectional squeeze. This is a new way to reduce break-out friction, lower running friction and provide much longer life for "O" Rings in pneumatic service.

High quality, *compression molded Precision* "O" Rings have proved to be the best solution to a wide variety of sealing problems. How about *yours? Precision* leads the field in engineering help. Send for our complete handbook on "O" Rings and let us help you.

FREE—Write for your personal copy of our Handbook on "O" Rings.

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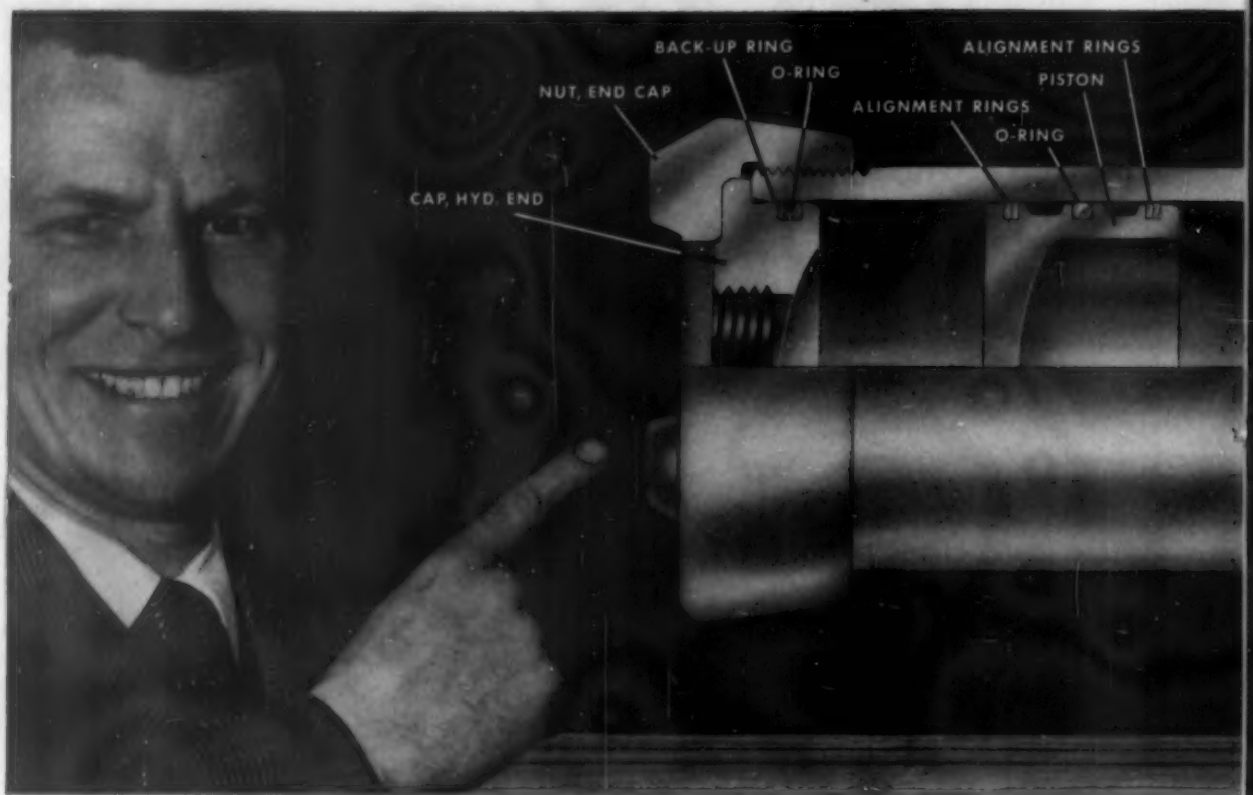


Introducing new Parker

Unique design avoids wear and maintenance, provides longer life than other types

Here at last is an industrial hydraulic accumulator that provides a longer life than conventional types.

As you see in the cutaway, construction is simple. The shell is corrosion-resistant alloy steel; the piston is aluminum. Wiper alignment rings support the piston. O-rings are used only to seal fluid and pressure. This unique design reduces frictional wear to a minimum.

The new Parker accumulator is designed for greater safety, too. During dismantling, a safety vent in the end cap warns of trapped gas pressure. It allows this pressure to escape before the end cap is removed completely.

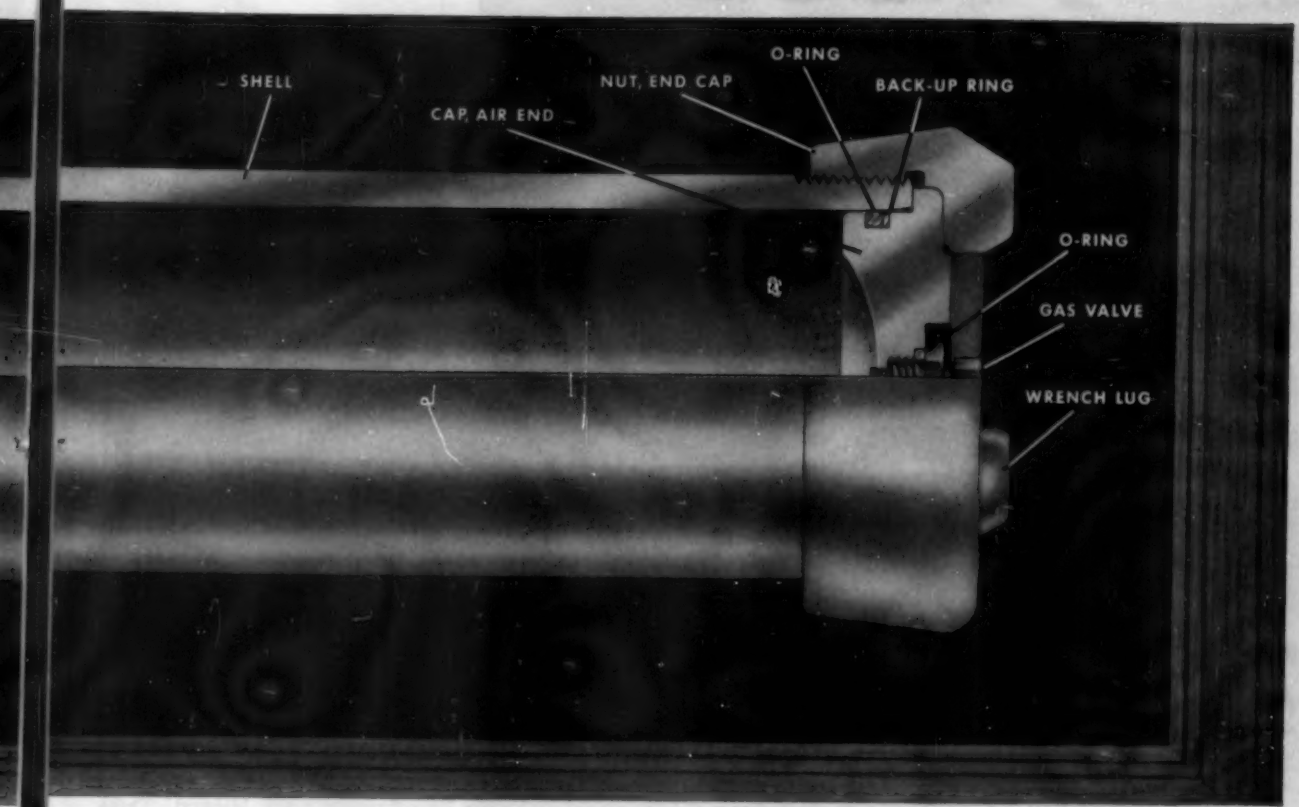
This new accumulator is offered in eleven sizes. Lengths vary from 9⅜ to 40 inches. Inside diameters are 1½, 4, or 7 inches. Oil volume capacities range from 10 to 1155 cubic inches. Maximum operating pressure rating is 3000 psi.

Also, for accessory use with accumulators, Parker offers a complete line of quick-opening, no-chatter check valves.

If you're not using accumulators, you'll find they can greatly simplify hydraulic system design, providing a means of steady power and saving wear on pumps. For information, mail the coupon.

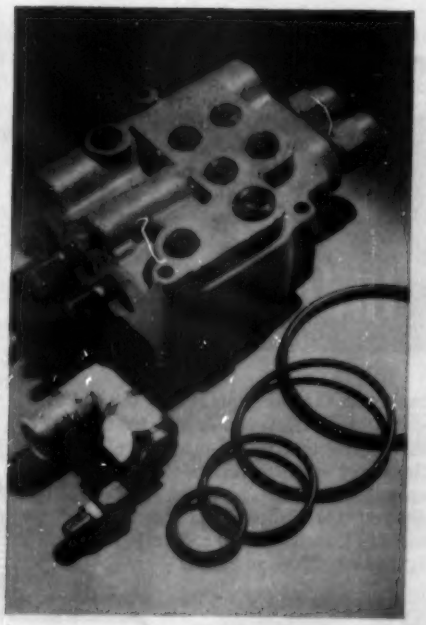
INDUSTRIAL HYDRAULICS DIVISION
The Parker Appliance Company
17325 Euclid Avenue, Cleveland 12, Ohio

Parker
Hydraulic and fluid system components



piston-type accumulator

100% safety tested on stands like this, all Parker industrial accumulators are checked at hydraulic pressures up to as high as 10,000 psi.



What other Parker products for hydraulic and fluid systems interest you? Triple-lok flare fittings? Ferulok flareless fittings? Synthetic rubber O-rings? Any other products?

THE PARKER APPLIANCE COMPANY
Section 202-F
17325 Euclid Avenue
Cleveland 12, Ohio

Please send the following:

☐ Accumulator Catalog File 1536A

☐ Catalogs describing these other Parker products_____

_____

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

Mail this coupon for technical information about Parker's trouble-free accumulator. If you'd like to know more about other Parker products, list them on the coupon.

Circle 63 on Reader Service Card

ABOVE: Vital to the high production maintained by Gunnison Homes, Inc. is this 650-ton hydraulic press used to bond plywood panels into strong, durable wall sections.

LEFT: Handsome, precision built homes, like the Gunnison Coronado pictured here, are built in a matter of hours.

Answers a pressing need for Gunnison Homes, Inc....

● Gunnison Homes, Inc., situated in New Albany, Indiana, is one of the leaders in the field of manufactured homes. Key to continuous production of precision built homes at the New Albany plant is the 650-ton hydraulic press, shown above, which was installed in 1947. This press processes ten plywood panels every cycle by the combination of heat and pressure . . . a tough job and one requiring reliable hydraulic performance to maintain production schedules.

STANOIL Industrial Oil was installed in the press when it was put into operation six years ago. STANOIL has stood the test of severe operation . . . with no evidence of oil deterioration being found during a recent inspection of the hydraulic system. Operation has been efficient. Minimum make-up oil has been needed to maintain the oil capacity of 450 gallons.

STANOIL
TRADE MARK
Industrial Oil

Find how STANOIL can benefit you by discussing this multi-purpose oil with a Standard lubrication specialist. You can contact him by phoning your local Standard Oil office. Or, write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

What's YOUR problem?

Ralph E. Murnahan, of Standard Oil's Evansville office, is the lubrication specialist who keeps in constant contact with Gunnison Homes to make certain that there is no interruption of operation due to lubrication difficulties.

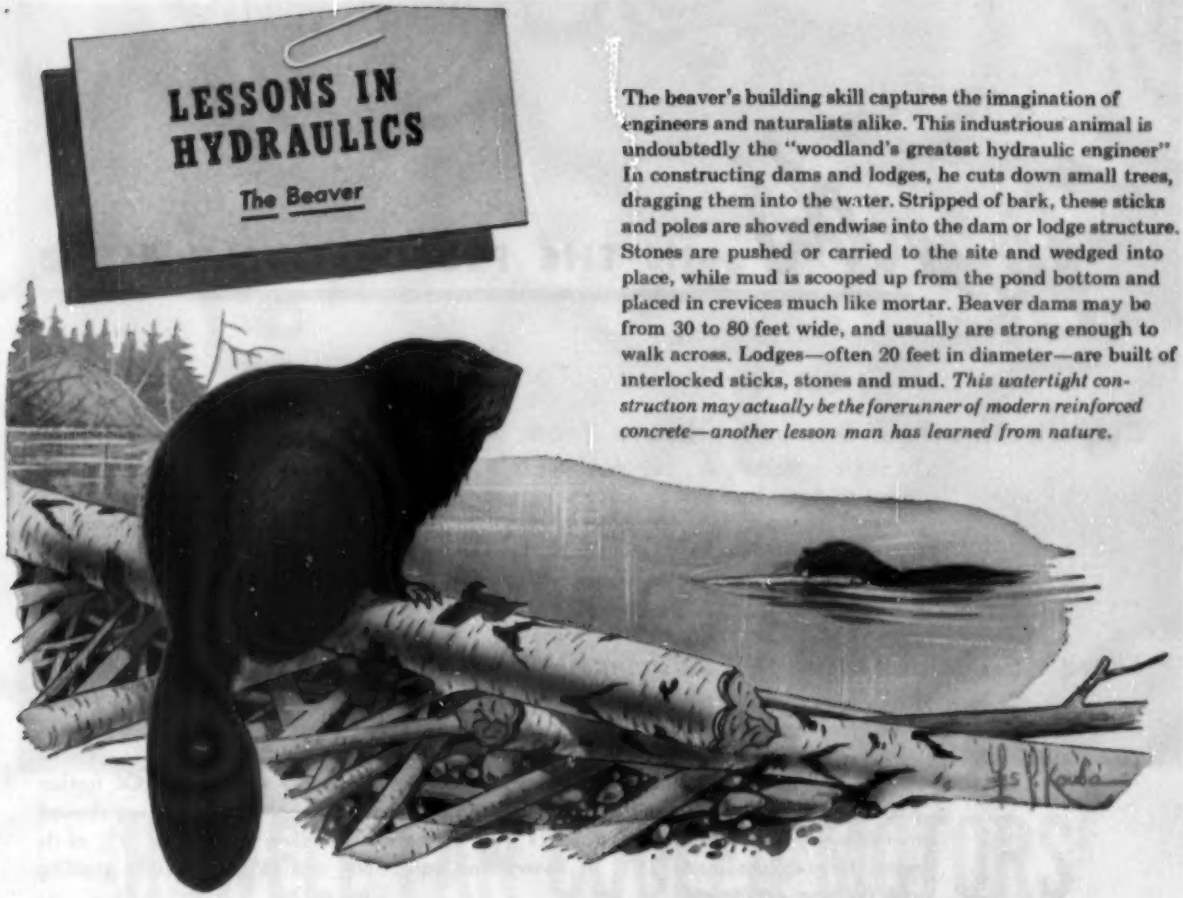
He is one of many lubrication specialists who make their headquarters in Standard's offices throughout the Midwest. These men have been specially trained in Standard's Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience.

To obtain the service of the lubrication specialist in your area, you need only call your local Standard Oil office. The lubrication specialist will discuss your lubrication problems with you . . . at no obligation to you, of course. He has a complete line of petroleum products to offer you, including:

SUPERLA Greases—Available in a wide range of consistency grades and in both lime-soap and soda-soap types. SUPERLA Greases cover a wide range of operations. These efficient products are comparable in quality with the highest type of special greases.

STANOLITH Greases—Because these unique lithium soap products possess the heat resistant properties of soda-soap greases and the water resistant properties of lime-soap greases, they offer a solution to lubrication problems caused by the presence of both heat and water.

STANDARD OIL COMPANY (STANDARD) *(Indiana)*



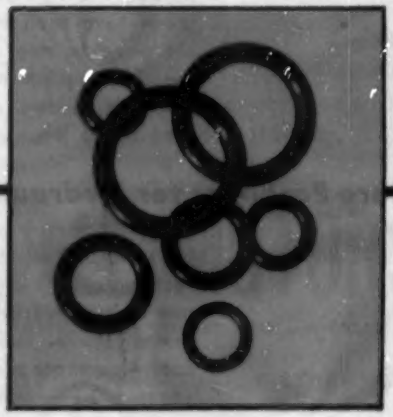
The beaver's building skill captures the imagination of engineers and naturalists alike. This industrious animal is undoubtedly the "woodland's greatest hydraulic engineer" In constructing dams and lodges, he cuts down small trees, dragging them into the water. Stripped of bark, these sticks and poles are shoved endwise into the dam or lodge structure. Stones are pushed or carried to the site and wedged into place, while mud is scooped up from the pond bottom and placed in crevices much like mortar. Beaver dams may be from 30 to 80 feet wide, and usually are strong enough to walk across. Lodges—often 20 feet in diameter—are built of interlocked sticks, stones and mud. *This watertight construction may actually be the forerunner of modern reinforced concrete—another lesson man has learned from nature.*

WOODLAND'S GREATEST HYDRAULIC ENGINEER

Many products have design features requiring a hydraulic seal with special properties in addition to close tolerances and extreme uniformity. If yours is such a product, you'll want to know more about *injection molded* Minnesota O-Rings. Available in numerous compounds of natural or synthetic rubber, Minnesota O-Rings have great tensile strength, extreme capacity for pressure, and high resistance to compression set, abrasion, and oil swelling. Check these examples of successful installations in air, gas, and hydraulic systems: dispensing mechanisms . . . hydraulic rams and valves . . . air cylinders . . . remote control mechanisms . . . spraying equipment . . . gasoline and steam engines . . . and water pumps. Minnesota O-Rings are the choice of industries leading engineers and product designers. For prompt analysis and quotation on your requirements, send us your blue prints or specifications.

INJECTION MOLDED MINNESOTA O-RINGS

Minnesota Rubber's exclusive injection molding process produces O-Rings and other small rubber parts to meet extreme uniformity and tolerance requirements . . . and at low average prices. *Send for bulletin on injection molded Minnesota O-Rings.*



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Circle 54 on Reader Service Card

APPLIED HYDRAULICS

Trends IN THE FLUID POWER FIELD

Can Machine Tool Designers Learn from Aircraft Engineers?

Frederick S. Blackall, Jr., past president of NMTBA and ASME, thinks they can when it comes to designing hydraulic circuits. In a recent talk, Mr. Blackall pointed to inadequately designed or low quality tubing and fittings as the reason for substantial maintenance expense and downtime on machine tools. He suggested that the application of piping techniques used by the designer of aircraft hydraulic mechanisms might prove valuable to machine tool builders.

There's a Lot of Obsolete Equipment Which Needs Replacement

That's what a recent survey made by ASTE showed. Roger F. Waindle, president of ASTE pointed out that the results of the survey are . . . "industry's own evaluation of the threat to survival in a competitive era posed by obsolete equipment and processes". The survey showed that about one out of three machine tools in use today is obsolete. Of further interest to the manufacturers of hydraulic and pneumatic components, the survey showed that industry also considers obsolete 28% of its material handling equipment, 28% of its metal forming processes; 25% of its welding equipment, and 25% of present grinding and finishing equipment.

Can We Get Enough Components When We Need Them?

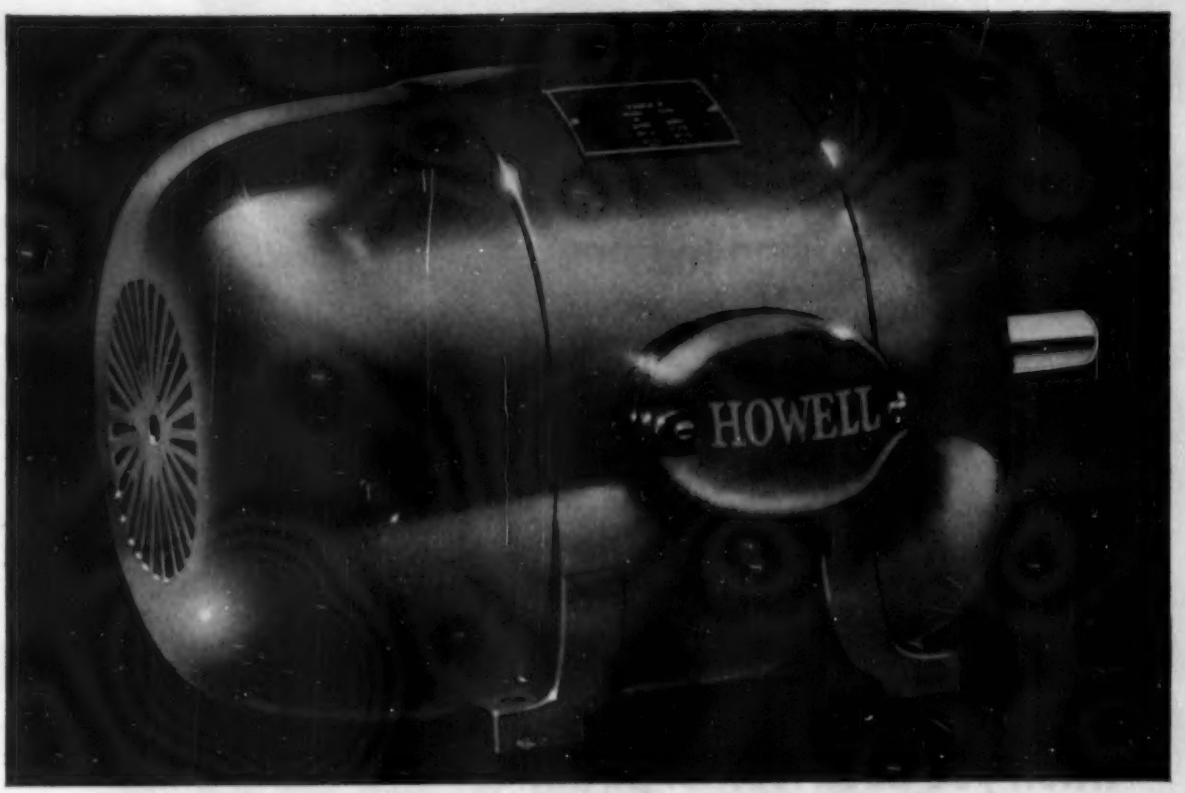
Although we're in a "cold war" economy an answer to this question is needed now. The Office of Defense Mobilization is looking for that answer. ODM is making a new component study. Allocating materials for pumps, valves, cylinders, gears, bearings, etc. was pretty much guesswork during World War II and after Korea. Final assemblies were held up for lack of small components. The problem is to determine total component needs under full mobilization. ODM's study involves 8000 component manufacturers. It's a tough job.

We'll Miss News of Steel Industry Expansion

During recent years we've seen the development of entirely new steel plants and the expansion and modernization of all steel making facilities. Most of these expansion programs have been completed. This means that mill equipment makers and their suppliers are going to meet tough competition. New business may come from foreign markets. American equipment builders will have strong competition for this business from West European builders. American component manufacturers might get good results from a hard selling job.

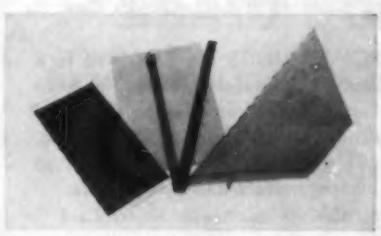
More Problems for Hydraulic Fluid Producers

Aircraft operation at speeds faster than sound and altitudes over 50,000 feet challenge the makers of aircraft hydraulic fluids. High pressure pneumatic systems offer many advantage over hydraulic actuation under high speed flight conditions. The top temperature limit of hydraulic fluids will have to be increased from the present 200F to over 500F. Present studies indicate that new fluids will need improved properties—oxidation resistance—low vapor pressure—non-corrosive—non-toxic—pour point below -65 F—flash point above 400 F—non-foaming—lubricity.



HOWELL FAN-COOLED MOTORS

Totally enclosed, protected against dust, fumes and moisture—the best looking motors your money can buy!



More and better insulation. Each slot cell has seven different pieces of insulation. Top and bottom coils and phase groups are insulated. Howell insulation is unsurpassed in quality.

Improved coil varnish. Type K stators are thoroughly impregnated twice with a phenolic, resin base varnish, and twice baked for unusual protection against moisture, dust, oil, weak acids and mild alkalies.

Howell Type K Motors outperform and outlast any open-type motor. Totally enclosed, all working parts are protected against the destructive action of dust, dirt, fumes and moisture. The fan-cooling prevents motor overheating.

The all-steel, streamlined housing conforms to the most modern trends in machine-tool design and factory layout.

Howell Type K Motors are available in all electrical types, from 1½ to 300 hp. at 1800 rpm., with vertical or horizontal mounting.

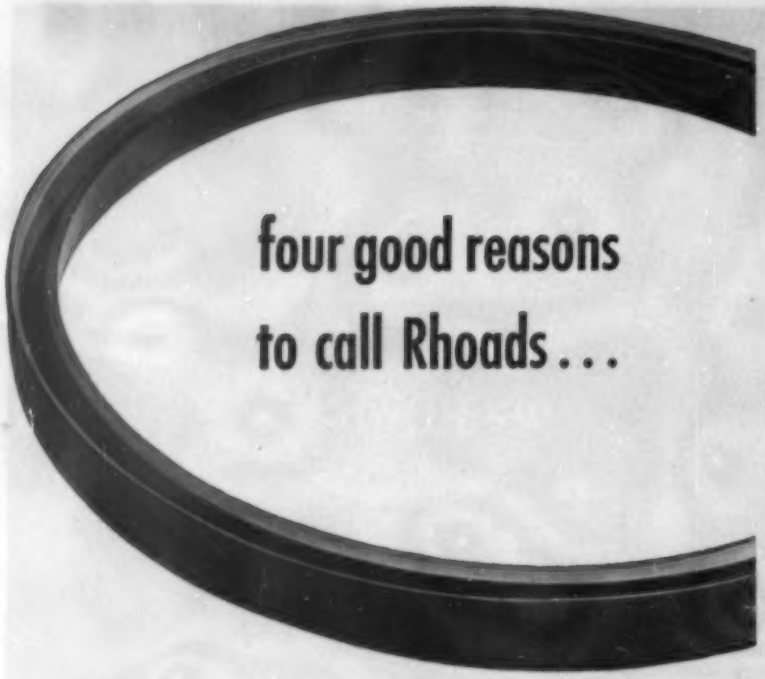
For more complete information on Howell's Type K Motors, contact the Howell man in your area, or write the factory for Bulletin K-2.

HOWELL Red Band MOTORS

HOWELL MOTORS

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915



four good reasons to call Rhoads . . .

when you need leather packings*

1. **They're job engineered from start to finish** by Rhoads engineers. Rhoads Tannate Leather Packings provide an effective seal against glycerin, alcohol, mineral, fish and animal oils . . . water, vegetable or any other non-caustic, non-acid fluid. They will not cold flow and will not score or abrade the most highly finished surface.

2. **They're made from specially tanned leather** to give them a low coefficient of friction, and build up desirable product characteristics to meet your exact requirements.

3. **They're custom impregnated** for operation ranging from a few ounces pressure to many thousands of pounds psi. Tannate packings can be made rock hard or flexible to meet your requirements.

4. **They're precision molded and accurately finished** to fit snug against shafts and cylinder walls. The exacting dimensions to which Tannate packings are manufactured insures a leak-proof seal.

* Available as U, Vee Cup and Flange leathers for hydraulic and pneumatic equipment.

RHOADS
INDUSTRIAL LEATHERS

PHILADELPHIA • NEW YORK • CHICAGO • ATLANTA

Free Literature Offered In this Month's Ads

For more information circle numbers on the reader service card bound in this issue.

AIR MOTORS AND HYDRO CHECKS are described in a new 36 page Bulletin No. CL-50, offered by The Bellows Co. The range of control possibilities is presented.

Circle 13 on Reader Service Card

"REPORT ON CONPOR" gives all basic information on this material. This booklet shows advantages of Conpor impregnations and reveals the development of the product. The booklet is available from Chicago Rawhide Manufacturing Co.

Circle 22 on Reader Service Card

PUMCUPS are described in Bulletin No. 4502, and is offered by Darling Valve & Manufacturing Co. Pumcups are available in sizes and engineered textures for virtually any service.

Circle 24 on Reader Service Card

CYLINDERS are covered in Bulletin #800 presented by Lindberg Engineering Company. It shows the complete line of standard and special, air and hydraulic cylinders.

Circle 49 on Reader Service Card

POWER UNITS are described in a fact filled catalog available from Hydraulic Power Division, The Hydraulic Press Mfg. Co. Catalog No. 601 gives complete information on pumps, motors and power units.

Circle 44 on Reader Service Card

AIR AND COOLING PROBLEMS can be submitted to Niagara Blower Company for solutions to save operating and maintenance expense. Write for Bulletin 98.

Circle 56 on Reader Service Card

INDUSTRIAL PUMP catalog for 1954 is ready for distribution. Several series of pumps, serving many different purposes are cataloged. It has been prepared by Oberdorfer Foundries, Inc.

Circle 58 on Reader Service Card

ANCHOR

DUCTILE-SLEEVE, TWO-WIRE BRAID HOSE ASSEMBLIES

for extra safety in high-pressure usage

Factory assembled to your specifications — you get just what you want — plus an extra margin of safety and dependability.

Exclusive, ductile-sleeve, swaged-on grip makes coupling virtually part of hose reinforcing wire — prevents blow-offs.

No leaks — positive seal eliminates leakage even under extreme pressures.

Cuts assembly costs — neat, compact design makes installation fast and easy — gives you a better-looking job.

Get all the details. Attach coupon to your letterhead and mail today.

NEW!
REVOLUTIONARY
ANCHOR FLANCO
SPLIT-FLANGE CLAMP
Positive leakproof connection without threaded joints. Bolt centers are located to distribute the forces evenly and prevent tilting of the clamp halves. Easy to assemble with small automotive-type wrench.

B-58

ANCHOR COUPLING CO. INC.

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FACTORY BRANCHES: DETROIT, MICHIGAN • DALLAS, TEXAS

Anchor Coupling Co. Inc.
Dept. AH24, Libertyville, Illinois

I'd like to know more about

- ☐ Anchor Ductile-Sleeve Hose Assemblies
- ☐ New Anchor Flanco Split-flange clamp-type coupling

Send me more information.

Name_____ Title_____

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Company Address_____

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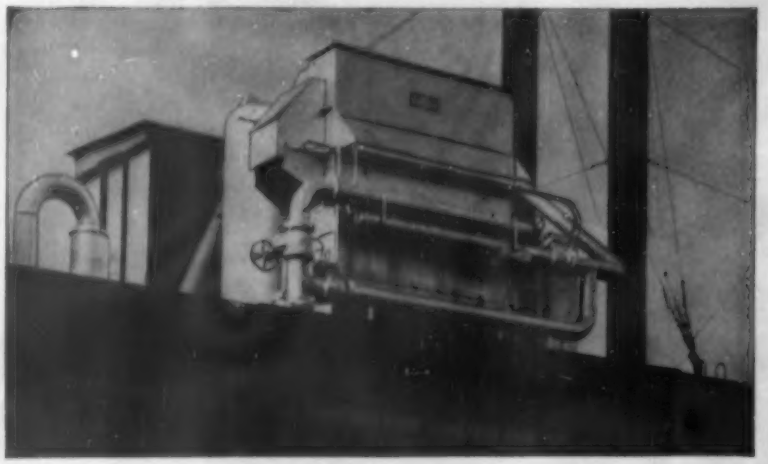
Direct saving of cooling water expense returns to you the cost of a Niagara Aero After Cooler in less than two years.



How to Get Drier Compressed Air:

It prevents many troubles and saves much expense

● NIAGARA AERO AFTER COOLER cools compressed air or gas below the temperature of the surrounding atmosphere. Therefore you get no further condensation in your lines. You save much in repairs to pneumatic tools and equipment; you save much interruption to production; you save water damage in paint spraying, in air cleaning, in any process where compressed air comes in contact with your materials or parts in manufacturing (sand blasting, for example).

Niagara Aero After Cooler uses evaporative cooling, saving 95% of your cooling water consumption. This saving quickly returns the cost of the equipment to the owner or makes extra cooling water available for other processes.

The Niagara Aero After Cooler produces compressed air with 30% to 50% less moisture than by ordinary cooling methods. Other Niagara equipment provides bone-dry air for processes requiring it.

If you have an air problem or a cooling problem, a Niagara engineer probably has an answer that will improve your process or save you operating or maintenance expense.

Write for Bulletin 98

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. AH, 405 Lexington Ave. New York 17, N. Y.

Experienced District Engineers in all Principal Cities of U. S. and Canada

Free Literature Offered in this Month's Ads

Continued

FLUID PRESSURE BOOSTERS are presented with full details in Bulletin B-200 offered by Miller Motor Company. Input range is 40 to 3000 psi air or fluid and the output range is from 200 to 10,000 psi fluid.

Circle 53 on Reader Service Card

HYDRAULIC PUMPS AND MOTORS are presented in literature available from Gerotor May Corp. Being able to supply immediately standard pumps from stock, individual requirements can be selected from this catalog and received promptly.

Circle 34 on Reader Service Card

CONTROLS CATALOG offered by Hannifin Corp. contains complete information and specifications on all Hannifin "P-M" valves, including the new 4-way direct operated series. Bulletin 232 is a complete air control valve catalog.

Circle 39 on Reader Service Card

HYDRAULIC HOSE SELECTOR is offered by Republic Rubber Div., Lee Rubber & Tire Corp. The selector is pocket-size and will give the correct specification number from any known factor.

Circle 73 on Reader Service Card

PERFORMANCE CHARTS and pump data sheets are available from Oil Hydraulics Div., Webster Electric. Your requirements can be described on these data sheets, so that proper selection may be obtained from the many types available.

Circle 97 on Reader Service Card

"O" RING HANDBOOK has been prepared by Precision Rubber Products Corp. and is complete with information to help answer questions on this subject.

Circle 68 on Reader Service Card

HYDRAULIC CONTROL SYSTEMS can be simplified, is the subject material in a new brochure offered by Almo Tool Co. Their method of channeling hydraulic fluids at high temperatures is described.

Circle 6 on Reader Service Card

ONE OF A SERIES

You Get Many Benefits
by Specifying VICKERS® Hydraulics

Hydraulics School for Customers' Own Service and Maintenance Men

Manufacturers who have Vickers Hydraulic Equipment on their machines can have their own service men trained in the Vickers Hydraulics School. Since its beginning in 1945, this school has trained more than 800 men from approximately 400 companies. There is no tuition charge for this training course.

These men are given a thorough schooling in hydraulic theory and practice . . . and in the operation and maintenance of Vickers Hydraulic Equipment. The benefits to manufacturers of Vickers-equipped machines are obvious. Of equal importance are the benefits to users of such machines who are thus assured of better maintenance.

Again, this is only one of many reasons why it pays to specify Vickers Hydraulics.

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DIVISION OF THE SPERRY CORPORATION
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Application Engineering Offices: ATLANTA • CHICAGO (Metropolitan) • CINCINNATI • CLEVELAND DETROIT • HOUSTON • LOS ANGELES (Metropolitan) NEW YORK (Metropolitan) • ODESSA • PHILADELPHIA (Metropolitan) • PITTSBURGH • ROCHESTER • ROCKFORD SEATTLE • TULSA • WASHINGTON • WORCESTER

6393

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

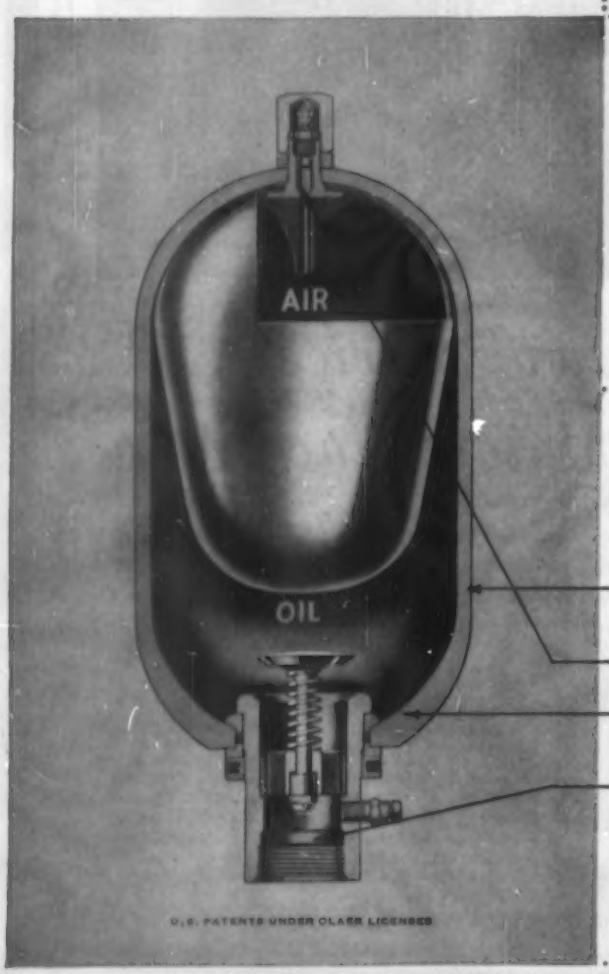
4 Important Reasons for Greer Accumulator Leadership

1 Performance

Today, more than 40,000 Greer Accumulators are in active use. They are found in every conceivable hydraulic system—in trucks, construction machinery, ships, planes, submarines and flying missiles. They power all types of presses, control steel processes, operate electric switches, and absorb pulsations in pipelines. Greer Accumulators are used effectively in almost any industry you can name.

2 Dependability

Greer Accumulators are *rugged*—each is precision-built to take many times the work load that could be reasonably expected. Proof of this fact is provided by the more than 5,000,000 cycles they have experienced. Many Greer Accumulator installations have served 8 years or more *without a breakdown.* Over 6,000 satisfied Greer Accumulator customers is an enviable and unmatched record in this field.



3 Experience

Greer application engineers are specialists in this specialized field. They *know* where accumulators belong for best performance and safety. These men can put many years of *practical* experience to work for you—experience that is hard to find perhaps impossible to match elsewhere. They are available for consultation on your request. Greer field service stands ready to serve users when and where it is needed—*anywhere in the world.*

4 Complete Safety

These exclusive built-in safety features fully protect your men and machines:

SHELL—No welds, seams or joints. Made of single-piece homogeneous chrome molybdenum steel. 18% elongation in two inches prevents crystallization. Saftey margin is 5 to 1.

AIR VALVE—Absolutely leak-proof for pressures up to 12,000 psi. Integrally molded, tripled sealed to prevent air loss.

MOUTH—Designed to yield at 400% of maximum working pressure. Pressure is released if system is blocked in any way. The Greer Accumulator is BURST-PROOF!

PLUG ASSEMBLY—Accumulator cannot be disassembled until air charge is completely released from bag. Lack of this protection has caused serious accidents.

Greer Accumulators meet all J.I.C. safety standards and conform with all safety codes of municipal, state and insurance underwriters in accordance with ASME specification on unfired pressure vessels.

GREER HYDRAULICS INC. · 454 EIGHTEENTH STREET · BROOKLYN 15, NEW YORK

Crescent Valve Performance

HIGH

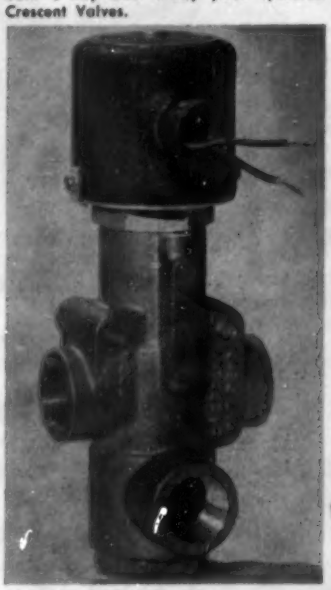
CYCLING

PLUS

TIGHT SEATS

AMAZING CONTROL

Continuous duty rating of 600 cycles per minute and bubble tight closure throughout the pressure range MEANS THIS TO YOU: No lag—you can squeeze and release spot welds, for example, with accuracy regardless of cycling rate. You can stop worrying about coil burn-outs. Besides, you get full flow through the valves, millions of cycles without maintenance, the lowest possible power consumption (relieving overloaded electrical facilities), an unlimited choice of voltages—AC or DC—by simply changing coils. Write for NEW catalog 3C-1 describing both 3-way and 4-way pilot operated Crescent Valves.



¼" to ¾" • 3-Way • Pressures to 500 psi

BARKSDALE VALVES

5125 ALCOA AVENUE, LOS ANGELES 58, CALIFORNIA

FREE USEFUL LITERATURE

Pressure Switch Selection Chart provides an easy method of finding a pressure switch for your specific application. This tabulation helps you define your requirements and saves you time in finding the correct switch for your job.

Check number M3 on the coupon below.

Piston Pressure Switch bulletin describes in detail the entire service range from 15 to 3000 P.S.I. (7000 P.S.I. proof pressure). Belongs on Production Equipment, where millions of cycles are expected, and on Original Equipment, where flexibility and price are vital factors.

Check number 9612 on the coupon below.

Variable Actuation Value Switch is outlined in this bulletin. They are bourdon tube switches with proof pressures to 12,000 P.S.I.

Check number 314 on coupon below.

The "Shear-Seal" Principle is a revolutionary twentieth century advancement in valving extreme pressures as well as low pressures and vacuum. The only known method to achieve leakproof closure and maintain or improve sealing qualities with use. This patented principle is illustrated and discussed in a comprehensive bulletin.

Check number BV-2 on the coupon below.

Solenoid "Shear-Seal" Valve Catalog gives complete information on line of shut-off, diverter, 3-way and 4-way selector, and 3 position selector valves for Air, Water, and Oil Service to 3000 P.S.I.

Check number 1B-2 on coupon below.

Solenoid Air Valves, the famous Crescent 3-way and 4-way valves, are catalogued with complete technical description in this eight page brochure. Where long service without valve maintenance or solenoid trouble is essential, these valves have become standard.

Check number 3C-1 on the coupon below.

New 20 page catalog includes all basic information on Barksdale Manual Shear-Seal valves, Solenoid Shear-Seal valves, Meletron Pressure Switches, and Crescent Air Valves.

Check number 3G on coupon below.

Barksdale Valves

5125 Alcoa Ave. L. A. 58, Calif.

M3 ☐ 9612 ☐ 314 ☐ BV-2 ☐

1B-2 ☐ 3C-1 ☐ 3G ☐

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Company .....

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In Hydraulic Packing—TEFLON is fast supplanting leather.

Because Teflon is chemically inert—it requires no chemical inspection, is unaffected by all hydrocarbons and newer synthetic hydraulic fluids. Its service temperature range is from—110° F to +500° F. It has unsurpassed anti-friction properties, is extremely resilient, tough, long wearing. It is waterproof, nonflammable. It requires no water-soak for installation.

CHEM-O-GREEN BACK-UP RINGS are an outstanding example of TEFLON'S superiority. Made in solid, split or the spiral type, preferred by engineers, they solve the "O" Ring extrusion problem. A companion product to Chemiseal synthetic rubber "O" Rings, they are sold as a "Packing package" for all commercial and AN requirements. Write for Catalog OB-1152.

CHEMISEAL V-TYPE PACKING made of Teflon—is ideal for either manual or automatically operated hydraulic valves. Seals with low gland pressures and operating torque. Supplied in sets with square-end Teflon adaptors. Ask for Bulletin No. 810-V.

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LETTERS to the Editor

Thermal Expansion of Hydraulic Fluids

We are having considerable trouble from thermal expansion of the hydraulic fluid in a newly developed closed circuit hydraulic control system. Can you recommend any liquid suitable for use as a light duty hydraulic fluid, one that would have a coefficient of expansion considerably lower than MIL-0-5606 fluid. The quantity of fluid involved is quite small.

LESTER L. MYERS,
Design Engineer,
Mobile Aerial Towers, Inc.
Fort Wayne, Ind.

We referred this question to several suppliers of mineral base and synthetic hydraulic fluids. Two answers are published below. Mr. Myers wrote us after this question was sent out giving these additional details:

The hydraulic control valves of our truck mounted aerial working platforms are remotely controlled by means of a triple master-slave system of our own design. Whenever the unit is subjected to a temperature change, such as transferring from a warm building to the cold outdoors, the change in volume of the MIL-0-5606 fluid used in the control system makes frequent synchronization of the controls necessary. Also, of even more importance if a unit is subjected to a sudden rise in temperature of 75 degrees or more, expansion of the fluid will often cause "O" ring seal failure. Since petroleum products have thermal expansion roughly three times that of water, I have hoped that one of the new water base hydraulic fluids or silicone base fluids might offer an improvement.

B. M. Dunham, Technical Consultant, Sun Oil Company, writes, in answer: After having studied the specifications of this type oil, it is not clear exactly what base oil

Continued on page 21

Strength and . . . when you need *Flexibility*

The Strength of Steel, plus the Flexibility of Rubber, is built into WIRETEX. Designed specifically as a high-pressure conductor for use on hydraulically operated road, farm, materials handling, coal mining and oil machinery, dump trucks, busses, snow plows, lubrication and railroad equipment . . .

WIRETEX Hydraulic Control Hose may be just the answer to your present problem . . . and it's easy to select, too . . . our pocket-size Selector will give you the correct WIRETEX specification number from any known factor . . . send for yours today!

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

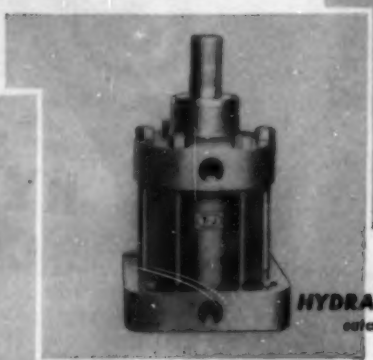
T-J

BUILT TO *TAKE IT!*

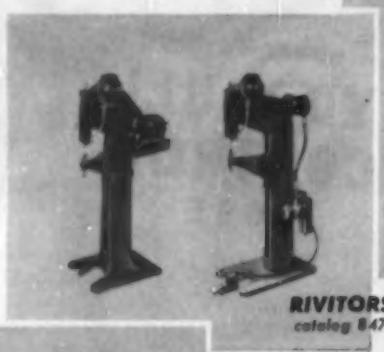
BACKED BY 38 YEARS OF KNOW-HOW!

SPACEMAKER AIR CYLINDERS
catalog SM 454

CLINCHORS
catalog 847



AIR AND HYDRAULIC CYLINDERS
catalogs 43 and H-47



RIVITORS
catalog 847

DIE SINKING MILLING CUTTERS
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REAMERS
bulletin 752 and 153

REMOTE CONTROLS
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Let T-J performance help you *save labor* and *reduce costs* in your plant today! You'll find T-J products soundly engineered and ruggedly built for tough jobs in a wide range of applications.

For efficient power movement in pushing, pulling or lifting—up to 50,000 lb.—T-J Air and Hydraulic Cylinders with new Super Cushion and space-saving features! For high production in rivet-setting, T-J Rivitors with automatic feeding and setting . . . air or electric power. For setting clinch nuts in automotive body panels, door locks and other products . . . T-J Clinchors! For more work between grinds in tough die steel... T-J Cutters! For accurate, automatic control of presses, brakes, other machines and equipment . . . T-J Air Controls! To cut replacement costs in half... T-J Reamers with interchangeable heads!

Get T-J all the way for tough jobs! Send for latest catalogs. The Tomkins-Johnson Co., Jackson, Mich.

TOMKINS-JOHNSON T-J

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

. . . for tough jobs

Spacemaker Cylinders:
Off shelf delivery all styles to 3" bore in increments of 1" to 12" stroke.

Letters to the Editor

Continued

is used. Actually the coefficient of expansion would be based upon the gravity of the base oil. Evidently the high viscosity index is procured through polymers and could be procured from several type base oils. If you will refer to the Tag Manual, you will find a table of standard abridged volume corrections. This table indicates that the coefficient of expansion is lowest for a group of petroleum oils up to 34 API gravity. In other words, the lower the API gravity or the more naphthenic the oil, the lower the coefficient of expansion. If you could tell us the viscosity limits which are necessary for your hydraulic system, we may be able to recommend an oil having the lowest possible coefficient of expansion for the viscosity limits involved.*

The second letter, in answer, comes from A. S. Randak, Manager, Technical Service, Sinclair Refining Company:

Copies of letters were transmitted to our Research Laboratory, who comment that they believe the problem is related to coefficient of thermal expansion rather than to rate of viscosity change with temperature. The laboratory also advises that it is questionable that any petroleum base product would be satisfactory as regards to thermal expansion. Various synthetic products, such as "Ucon" of Carbide and Carbon Chemicals Company or possibly hydraulic brake fluids might be considered. Such materials can be expected to have a smaller thermal coefficient than materials of petroleum origin. Although they would obviously not be covered by Specification MIL-0-5606, it is possible that one or more might be found which might suit the application.

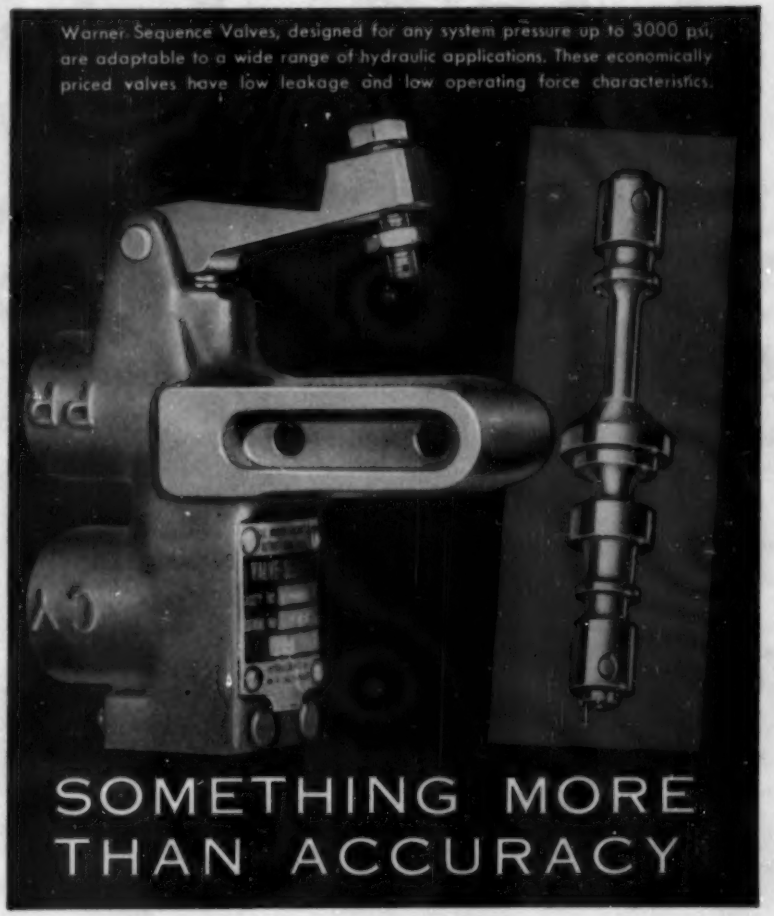
*The Tag Manual (for Tagliabue) is no longer current; however, the same data may be obtained from A.S.T.M. and S.A.E. Specifications.

Special Pilot Operated Valve

I am looking for a pilot operated valve with special characteristics. The two-way valve is used to seal off a gas chamber (nitrogen) at 1000 psi; the pilot section of the

Continued on page 25

Warner SEQUENCE VALVES


Warner Sequence Valves, designed for any system pressure up to 3000 psi, are adaptable to a wide range of hydraulic applications. These economically priced valves have low leakage and low operating force characteristics.
SOMETHING MORE THAN ACCURACY

Precision machining ability involving special lapping techniques to hold extremely close tolerances is only a part of the story behind Warner Hydraulic Equipment.

For many years Warner has specialized in the design, development and manufacture of precision hydraulic equipment. As a result of this comprehensive experience Warner is well qualified to assist you in the development of special hydraulic equipment to meet your particular requirements.

We invite you to utilize Warner's specialized experience in the field of hydraulics by giving our engineers and laboratory technicians an opportunity to work with you in the early stages of design and development.

Send today for your copy of an illustrated folder describing typical examples of Warner Hydraulic Equipment.

Warner DIVISION OF DETROIT HARVESTER CO. OF N. Y. INC.

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Sales Branches at

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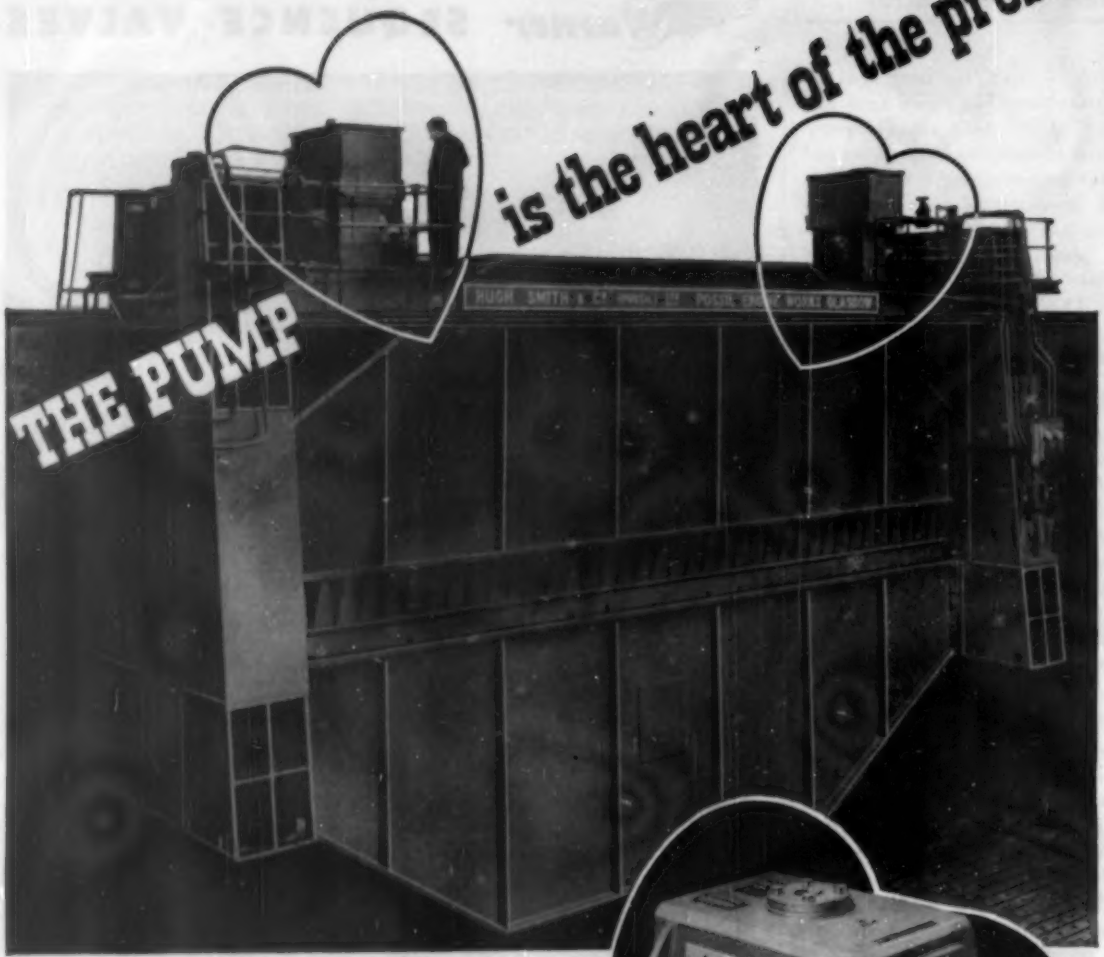
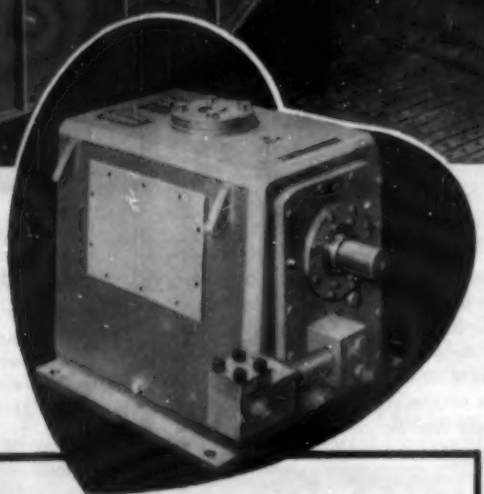
THE PUMP is the heart of the press . .



A 1,200-ton self-contained press by Hugh Smith & Co. (Possil), Ltd., designed for the manufacture of corrugated bulkheads for ships, and is also applicable to general flanging work in lengths up to 40 ft.

This fine example of British press design incorporates "Electraulic" pumps and controls for :—

(*a*) Consistent and unfailing performance.
(*b*) Power output variable as required.
(*c*) Instantaneous response to finger tip control.
(*d*) Economy.
(*e*) Completely self-contained unit.



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REGD. TRADE MARK
HIGH SPEED
HYDRAULIC PUMPS

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JACK SEARLE PACKINGS

FOR YOUR SPECIFIC REQUIREMENTS

Jack Searle Inc. leather packings in all types are made from choice selected hides. Leather and the impregnation is according to your specific requirement to insure you getting maximum wear.

Besides making our packings from leather, we also manufacture all types in molded synthetic rubber from hundreds of formulas, covering all necessary specifications.

Our modern plant has complete facilities for Production Quality from the raw materials to finished product, covering all types of packings and packing material. Our services are nationally known.

Quality packings in your production, is your assurance against costly breakdowns, because no machine can operate to capacity with packings that allow leaks to occur under pressure.

Do you get maximum wear from your packings? If not, why not investigate Jack Searle Packings.

Do you have constant maintenance cost due to breakdowns . . . our packings assure longer life . . . regardless of application . . . let us prove it. Do you get PROMPT service . . . not months . . . days . . . It will pay you to give us a trial order.

Send your specifications to our engineering department, and let us send you samples and recommendations for your problem. You are under no obligation for this service.

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Predetermined SAFETY and CONTROL

Automatic Transportation Company uses Waterman Flow Regulators as standard equipment on fork lift trucks. Mast Control for raising, lowering, forward tilting and reverse tilting is all controlled at a safe, efficient operating speed regardless of load on the forks.

When Automatic Transportation Company decided to use hydraulic pressures (2500-3000 PSI) never before attempted on fork lift trucks, they were faced with the problem of obtaining the right flow regulator. They turned to Waterman for the answer! Now, anything from eggs and television sets to molten metal or automotive dies can be lifted, lowered and transported safely, smoothly, and efficiently, thanks to Waterman Flow Regulators.

If you have a flow control problem, Waterman can do the same for you. Where ever constant flow of fluid is required regardless of pressure or back pressure fluctuations, Waterman Flow Regulators are the answer. More and more manufacturers incorporating hydraulic equipment in the products they manufacture are finding that Waterman Flow Regulators simplify circuits, reduce weight, space and cost while providing automatic flow regulation.

Available in a range of sizes and a variety of models to take care of your requirements.

Waterman

ENGINEERING COMPANY

725 CUSTER AVENUE • EVANSTON, ILLINOIS

Write for our illustrated brochure A

Letters to the Editor

Continued

valve is hydraulically operated (pure water at 850 psi). Do you know of anyone who makes a valve which might work in this application?

AARON BAUMGARTEN,
Mechanical Engineer,
Walter Kidde Nuclear Laboratories, Inc.
Garden City, N. Y.

The valve you describe very probably must be made to specifications. However, we suggest you try Marotta Valve Company, Boonton, N. J.

Small Water Motor

We wish to obtain a water motor or turbine that would develop approximately 1/6 to 1¼ hp. We would appreciate the names and addresses of the manufacturers of such units.

FRANK J. LINDIG. JR.
President
Lindig Mfg. Co., Inc.
St. Paul, Minn.

This is a bit out of our line but we have determined that Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City 1, N. Y. manufactures a water motor that develops the range of power you mention. While this unit was developed for use with a piece of equipment for cleaning boiler tubes, we have been assured by a man familiar with the unit that it could be adapted for such a use as you propose.

High Pressure Solenoid Valves

What information do you have on manufacturers of high pressure (6000 psi) two-way solenoid valves. We would be interested also in other components for system pressures at 6000 psi.

E. SARFATY
Research & Development
Greer Hydraulics, Inc.
Brooklyn, N. Y.

Relatively few manufacturers build standard valves for 6000 psi operating pressures. We can suggest the following: Marotta Valve Corporation, Boonton, N. J.; Hoppe

Continued on page 26

ALL COMERS!

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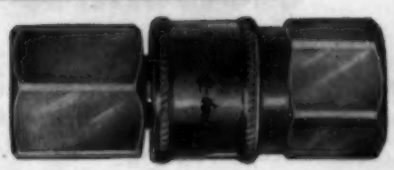

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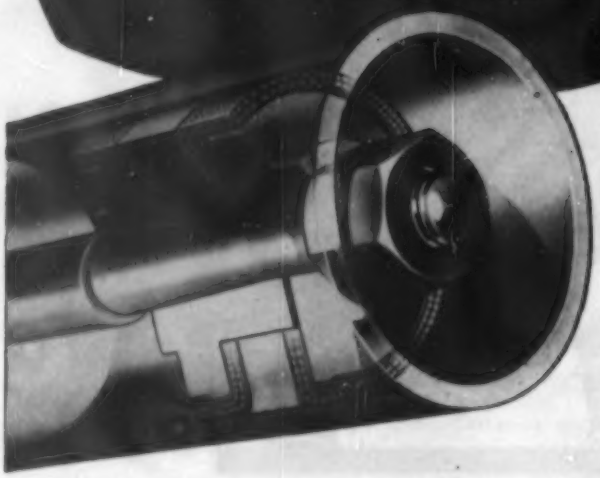

THERE are two basic, well-proved reasons why more and more Darcova Pumcups are going into cylinders of air and hydraulic controls and mechanisms.

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Letters to the Editor

Continued

Engineering Co., Inc., Greensboro, Ind.; Macmillan Engineering Corporation, 1737 Howard St., Chicago 26, Ill.; and Harwood Engineering Co., Inc., Walpole, Mass.

Avoiding Shock in Piston Type Pump

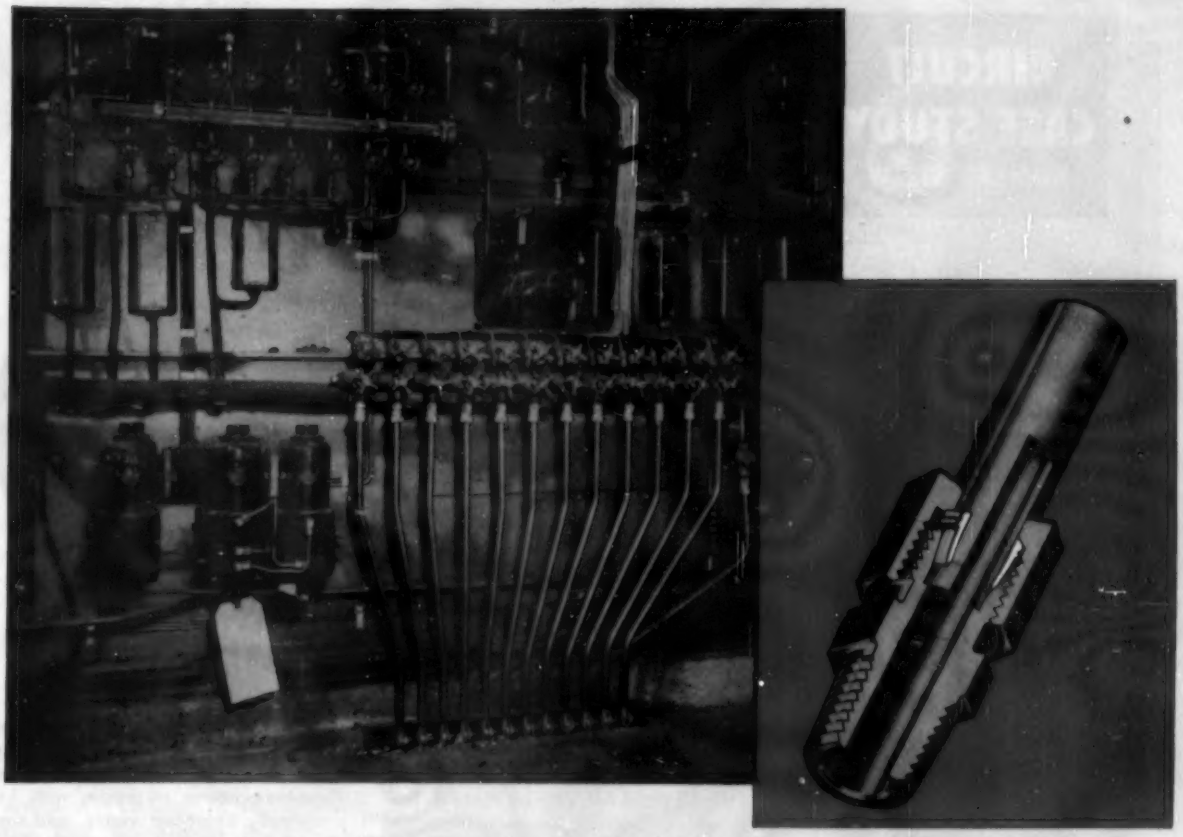
Recently we have been interested in subjects similar to your April 1953 article, "Pump Design Gives Controlled Delivery with Variable Input Speed". We would like to ask one question concerning this article —how is shock avoided when the piston meets the eccentric during the rotation with the resulting abrupt change in momentum present for anything other than full stroke setting? We cannot understand how one can limit the return stroke of the pistons and expect them to be accelerated sinusoidally on the next succeeding pressure stroke.

ROBERT E. RAYMOND,
Sales Engineer,
Simplex Engineering Co.
Zanesville, O.

We submitted this question to Mr. J. A. Morrow, Vice President, Shallcross Controls, Inc., designer of the pump described in the above mentioned article. His answer, in part, follows:

Your question concerning the avoidance of shock when a piston begins pumping, or in other words, becomes tangent to the rotor chamber bore, is a very searching one and deserves a detailed answer. We have arranged our structure so that a piston when making only partial stroke is momentarily locked in a given position after it has ceased communicating with the intake groove and before it starts pumping. It holds its position because it cannot move outward due to external pressure in the rotor chamber during the time it communicates with the intake groove; it cannot move outward during the time it communicates with the discharge groove, but it is not tangent to the rotor chamber bore because of the check valve. Since the piston is not moving outward just before it becomes tangent, there is a negligible

Continued on page 29



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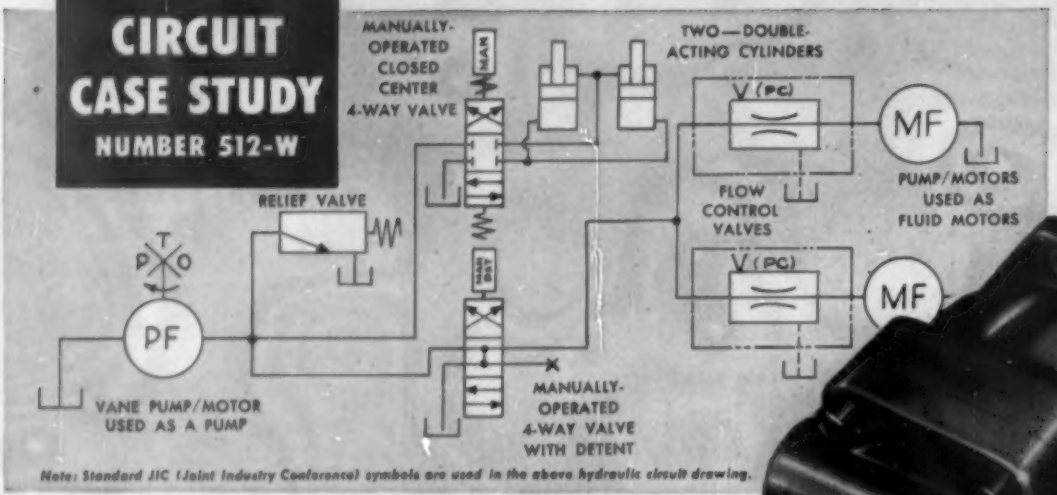

Underwater weed-cutters powered by DENISON HydrOILic Pump/Motors

Unusual Circuit Also Features Denison Valves and Controls

Denison Controls and **Pump/Motors** power triple cutter bars in a fleet of boats specially developed to clear shallow inland waterways of weeds and other vegetation.

The circuit, shown above, affords positive control and power to three cutter bars, mounted on each side and across the bow of the boats. It replaces a complex, hazardous mechanical setup of open, rotating shafts, gears, pulleys, chains and belts.

The gasoline engine which powers the boat also drives a Denison **Pump/Motor** which acts as a pump.

Two additional **Pump/Motors**, one at the rear of each side-mounted cutter bar, drive the cutters through 5-to-1 reduction gearing and eccentrics. Drive rods delivering power to the cutters are interconnected by bell cranks.

A Denison 4-way valve, with detent, controls these two **Pump/Motors**. The detent permits the operator to leave the valve in either the "operating" or "off" position without holding the lever.

A Denison relief valve limits system pressure to the maximum pre-set rating. The mechanical linkage formerly used was subject to severe damage if the cutters struck an obstacle. Now, however, the cutters merely stall, and excess flow "spills" through the relief valve.

A second Denison 4-way valve with a closed-center spool controls double-acting cylinders which raise and lower the cutter bars. By simply centering this valve control, the operator can hold the cutters at any height.

This type of circuit emphasizes advantages of Denison **Pump/Motors**. Each unit is ready for either pump or motor duty *without alterations!* A single "spare" can replace any of the three units, in any of the boats. **Pump/Motors** are single-stage, vane-type power packages with hydraulically balanced vanes, and simplified three-unit construction. They stand up under *long, hard, continuous duty* at pressures up to 2000 psi. Four sizes—each with a choice of cam rings for different needs—offer pumping capacities from 3 to 82 gpm . . . motor capacities from 8 to 98 hp (13 to 257 inch-pounds of torque per 100 psi.) All models can provide either clockwise or counterclockwise rotation.

Denison offers an outstanding line of high pressure oil hydraulic pumps, motors and controls, for pressures to 5000 psi. Designed with skill and knowledge gained through twenty-five years of leadership in oil hydraulics, they have the compact ruggedness needed for exacting, heavy-duty demands. Wherever you need closely adjustable power and control with unlimited operating flexibility, specify HydrOILics. Write for more details.

The DENISON Engineering Company, 1166 Dublin Road, Columbus 16, Ohio

Letters to the Editor

Continued

striking against the bore. Should you have further questions in consequence of the above explanation, feel free to address them directly to us.

Magnetic Flowmeter

In Mr. H. L. Kressin's article "Flow Measuring Instruments" (November, 1953 issue of APPLIED HYDRAULICS) he described an electromagnetic flow meter. We would like to obtain additional information on this type of instrument and would appreciate the manufacturer's name and address.

JOS. W. GASTELUM,
Leslie Salt Co.
Newark, California

The magnetic flow meter described in the article is marketed under the name of "Magnaflow" and is a product of Mittlemann Electronics Division, Century America Corporation, 549 W. Washington Blvd., Chicago 6, Ill. If you will give Mr. Eugene Mittlemann of this company such data as maximum flow rate, minimum flow rate, liquid to be metered, maximum flow fluctuations maximum pressures, temperature range and required accuracy, he will be able to offer assistance with your problem.

Locating Leaks in a Hydraulic System

We are interested in obtaining a testing device for locating leaks in a hydraulic system. Unfortunately, I am not in a position to describe the complete operation of the system; however, it consists of two tanks, one of which is under 180 psi pressure. This tank has 99 valves connected to it. Leaks which have developed once in a while in these valves have been troublesome and have been located in a hit-or-miss fashion.

E. P. CARRIGAN,
Howard Davies, Inc.
Philadelphia, Pa.

We invite suggestions of a device, preferably one which has had successful operating history.

Continued on page 31

Big one: Anker-Holth Rotating Hydraulic Cylinder with 21" bore and 20" stroke, for 3000 psi. Little one: Anker-Holth Air Cylinder with 3" bore, 3" stroke.

Anker-Holth has the answer!

• Your problem in power motion may be far removed from the Anker-Holth Cylinders shown above. Whatever your need for air or hydraulic cylinder power, Anker-Holth has the engineering know-how and manufacturing facilities to match your specific requirement. Anker-Holth engineers will gladly assist you. Call or write Anker-Holth Division of The Wellman Engineering Company, Dept. C-8, 2723 Conner Street, Port Huron, Michigan.

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If You, too, Prefer a Built-in Hydraulic Pump...

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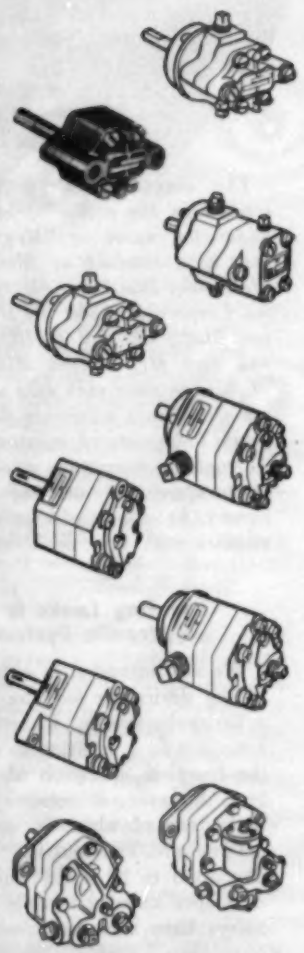

• The WEBSTER pump on this Joy Portable Compressor is face-mounted on the crankcase and gear-driven from the crankshaft. It is a compact, durable, positive displacement helical gear-type pump which provides force-feed lubrication.

This is but one of 90 types of WEBSTER Oil Hydraulic Pumps with capacities from 10 gph to 10 gpm—at pressures up to 1200 psi—speeds to 3600 rpm—with or without built-in relief valves—for sealed or wet sump mounting. One of these models might very well suit your needs because their custom-built design permits easy adaptation to your system.

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Letters to the Editor

Continued

High Pressure Water or Oil Cylinders

From time to time we are asked by our customers to supply cylinders, hydraulically operated, that will handle oil or water up to 2500 or 3000 psi. Would you advise us which manufacturers make cylinders of this type that can be sold through distributor organizations.

MILTON M. DUBIN,
Sales Manager,
Lincoln Supply Co.,
Providence, R. I.

You will find such lists on pages 145 for oil and 146 for water hydraulic cylinders in the January, 1954 Directory issue. Some manufacturers offer cylinders for both oil and water service in this range of pressures. Since about 75 percent of cylinder manufacturers sell through distributor organizations, we are sure that a number, not now represented in your area, would welcome your inquiry for such representation.

A New Idea in an Old Industry

We are interested in the article "Old Industry, New Methods" by W. H. Rathgeber published in the June, 1951 issue of APPLIED HYDRAULICS. As a research organization it is our endeavour to interest our members in articles such as these. We should very much appreciate permission to reproduce this article by means of photostat.

C. N. KINGSTON,
Senior Research Officer,
Cutlery Research Council,
Sheffield 10, England

We are very happy to give you permission to reproduce this article for the purpose of calling it to the attention of your members. The air operated trimmer, which plant personnel call a "tango" machine, is one of the reasons why this plant, a leading producer of fine silverware, has been able to step up their production and to cut costs on types of fine silverware that at one time were made entirely by hand. Incidentally, the acceptance of modern production equipment in this plant has been very gratifying.

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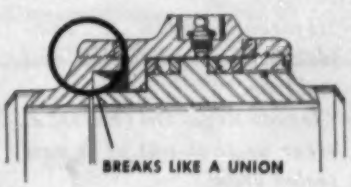
The packing of any Emsco Swivel Fitting may be readily removed from the Swivel Fitting Assembly without disturbing the rotating parts. This feature allows for the easy replacement of the packing element without breaking end connections.



When making inquiries or when ordering, simply tell us the nature of your application, the fluid, temperature and type of end connections required. Complete information awaits you.

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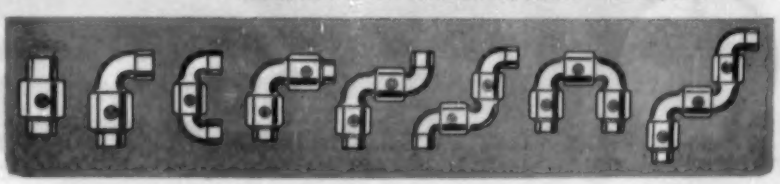

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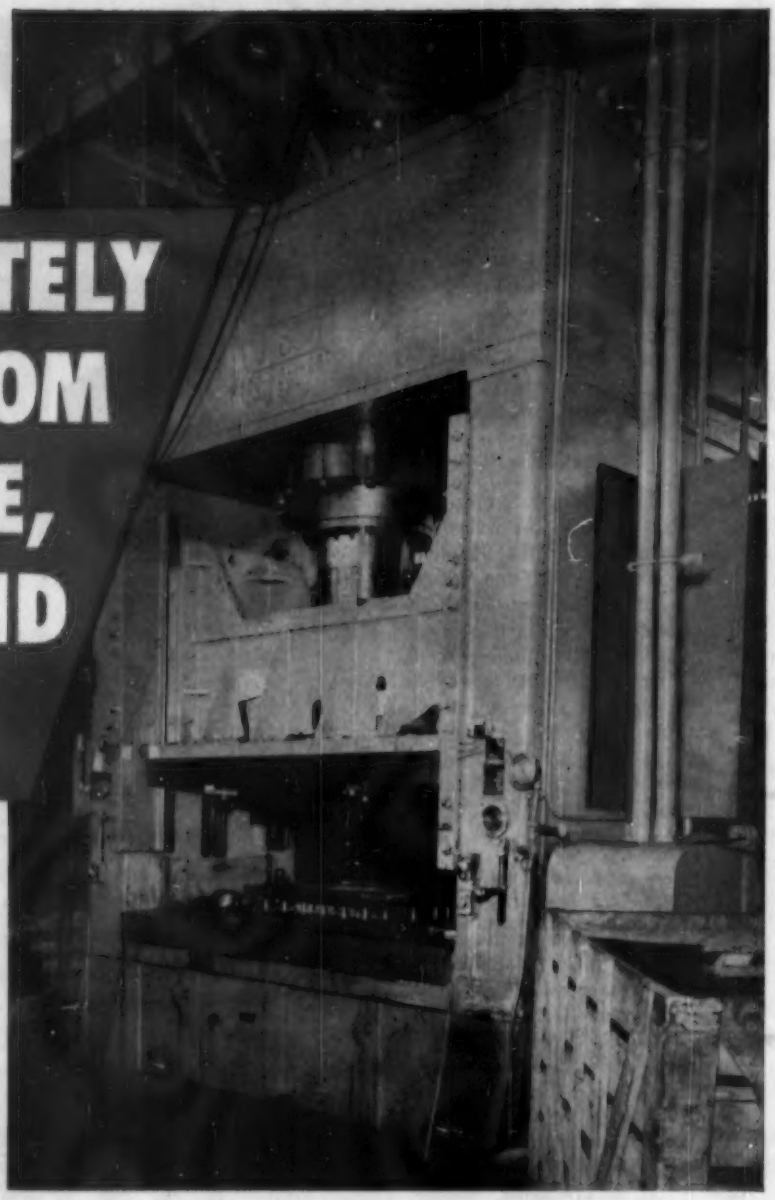

TEXACO REGAL OIL (R&O) has been used by a midwest company (name on request) in a 500-ton Verson press for more than five years. These outstanding results are reported:

1 — *"Hydraulic system . . . completely free from sludge, rust and foam."*

2 — *"Texaco Regal Oil (R&O) as clear as that out of a new sealed drum."*

3 — *"In spite of severe service . . . the press has never had to be down for repairs."*

Such results have benefited users everywhere of *Texaco Regal Oil (R&O)*. It is the lubricant that tests prove has *more than ten times the oxidation-resistance* of ordinary turbine-quality oils—proven ability to prevent rust and foam.

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TUNE IN . . . METROPOLITAN OPERA radio broadcasts every Saturday afternoon. See newspaper for time and station.

Why use both air and oil on the same machine? Here's the story of fluid power design on resistance seam welders.

Air and Oil Circuits Are Combined for resistance welders

By Leroy R. Conklin

BOTH air and hydraulic circuits are often used on the same resistance seam welding machine. Because an air supply is usually available and because of the ease and simplicity of installation and pressure regulation, a pneumatic cylinder is used to give welding pressure. Because an oil circuit provides controlled motion, a hydraulic cylinder is used to feed the welding electrode.

The design of welders using fluid power to move the electrode and to apply pressure has gone through several stages since the early machine shown in Figures 1 and 2.

Total travel on this early application was approximately eight inches and the desired maximum weld speed was 100 ipm with a return speed of up to 350 inches per minute. It was decided that a two inch diameter hydraulic traversing cylinder would have ample power to move the slide as desired. As a source of power and to achieve the desired speeds, a hydraulic pumping unit with a constant delivery, vane type, double pump with integral valves was used. This required a three horsepower motor and had a rated output of approximately three gallons per minute at high pressure and fourteen gallons per minute at low pressure. A double solenoid operated valve was used to operate the slide cylinder, and in each oil line to the cylinder was a specially made needle valve with a built in check valve.

By balancing the settings of the integral pump valves against the resistance to movement of the slide, it was possible to have the pump deliver high pressure, low volume during the welding operation (when the slide carried the greatest load), and deliver a lower pressure, high volume when the slide was returning (under low load) and thus obtain the two maximum speeds.

Speeds less than maximum were achieved by regu-

LEROY R. CONKLIN, Section Chief, Mechanical Engineering Department, Taylor-Winfield Corporation, Warren, O.

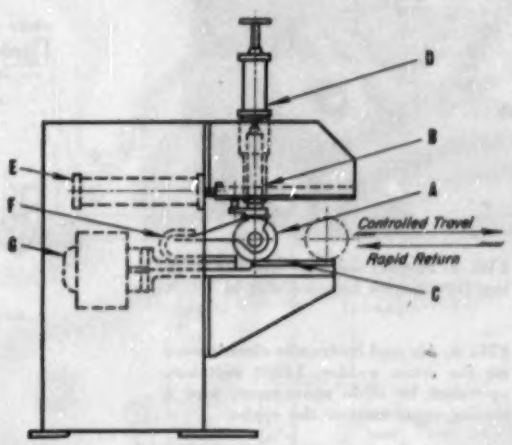


FIG. 1. The typical welder is one in which the upper roller electrode (A), which is mounted on a slide, (B), travels across the part to be welded which rests on a stationary lower electrode (C). Pressure on the electrodes (welding pressure) is supplied by a cylinder (D), usually pneumatic, operating through a ram to which the upper roller housing is attached. The slide is moved by another cylinder (E). With the usual circuit, uniform, controlled traverse is obtained during the outward or welding stroke, and there is rapid inward or return travel.

lating the needle valves. These valves with built-in checks, controlled the outgoing flow thru the respective cylinder lines since the check valves permitted free flow inwardly. Thus the welding and return speeds were individually adjustable.

Limit switches operated by cams on the slide, controlled the amount of slide travel and initiated and cut off the welding circuit. The circuits are shown in Figure 3.

The air cylinder, Figure 4, used to supply welding pressure in this circuit was an adjustable stroke cylinder which was developed primarily for seam welders and the same type is still used today. Its purpose was to limit the upward travel of the upper roller electrode and housing as the electrode wore and decreased in diameter. It served to eliminate lost motion and time during the upward travel and to conserve air.

The next major development or change in the circuit design was brought about primarily by the desire for a less expensive installation and a special requirement for a military application in 1943.

The special requirement was a need for two speeds forward, consisting of rapid traverse at approximately 360 ipm for a little less than four inches and a controlled speed of 160 ipm maximum for about ten inches. Rapid return speed was to be about 360 ipm. To accomplish this, it was decided to use an air cylinder (5 inch diameter, 14 inch stroke cushioned at the blank end) for the motive means since air was already being used on the machine to supply the welding pressure. A two inch diameter hydraulic cylinder with its piston rod attached to the slide was used to smooth out the motion of the slide, since air usually is rather erratic in controlled motions of this type, due to its compressibility. The hydraulic cylinder also provided a good means of regulating the speed of forward travel of the slide.

A standard flow control valve with a capacity of 750 cu in per minute was installed in the circuit in such a way that oil flow from the rod end of the cylinder was restricted by the valve, as shown Figure 5.

Normally in an installation of this kind where rapid return stroke is desired, a check valve is connected in parallel with the flow control valve in such a way that the oil flow by-passes the flow control restriction during the return stroke, and full flow must pass thru the restriction during controlled travel.

Circuit for Two Forward Speeds

To achieve the two forward speeds in the installation under discussion a solenoid controlled two way valve was substituted for the check valve and hooked up electrically so that in its normal position the valve was open. This meant that the valve permitted full unrestricted flow when the solenoid was deenergized and acted as a check, directing all oil flow thru the

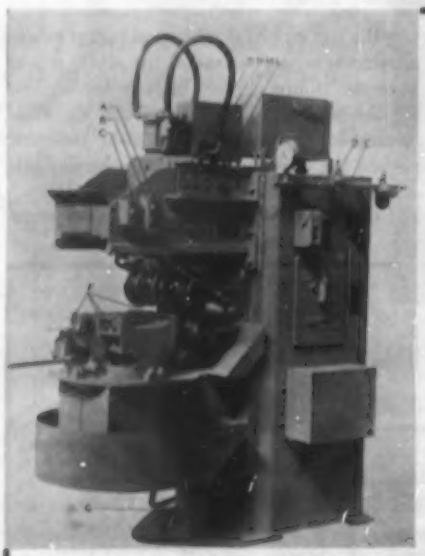


FIG. 2. Special seam welder for welding ferrules on horns. Built in 1939.

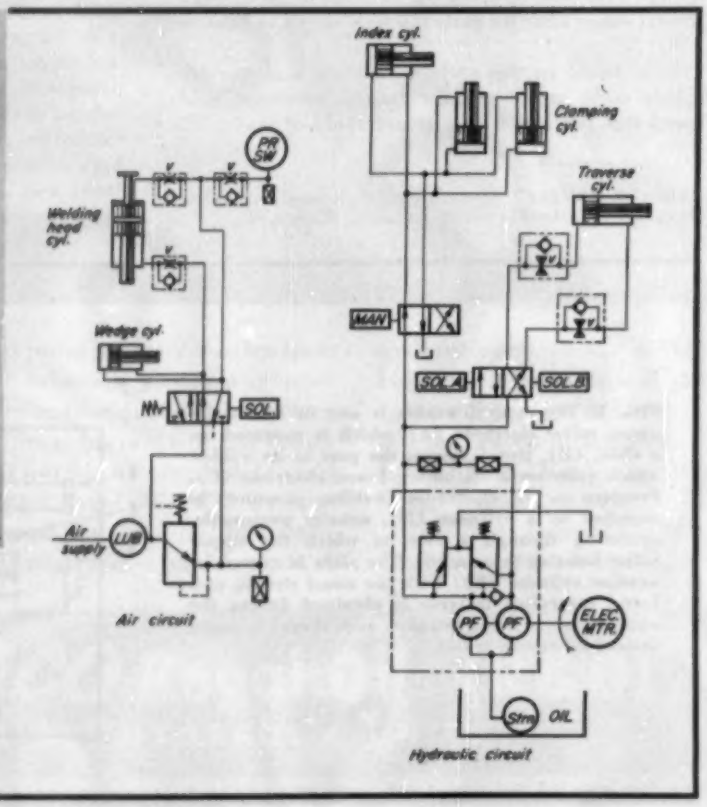


FIG. 3. Air and hydraulic circuit used on the seam welder. Limit switches, operated by slide movement, and a timing relay control the cycle.

control valve when the solenoid was energized. Thus by operating limit switches with cams mounted on the slide, it was possible to energize or deenergize the solenoid valve at any desired point and achieve restricted or unrestricted flow at any point in the slide travel, thus obtaining two speeds, regulated and rapid traverse.

After the machine was in operation, it was found that a flow control valve of 500 cu in per minute capacity functioned more effectively than the 750 cubic inch per minute capacity valve over the range of desired speeds. Also it was found that the gravity feed line with the check valve as shown in Figure 5, was not necessary for proper operation and was omitted in later models.

Figure 6 shows the physical arrangements of the components including the flow control valve at (E), and the gravity feed reservoir on top of the frame.

This basic design was in use with only slight modifications until 1951 when it was decided to completely redesign the machine to achieve better efficiency and appearance as well as meeting J.I.C. standards.

The general layout of the machine was changed considerably as shown in Figure 7. From a pneumatic and hydraulic standpoint, there were four major changes from the previous design.

First, the motive power finally decided upon was a tandem type air-hydraulic cylinder (C), which

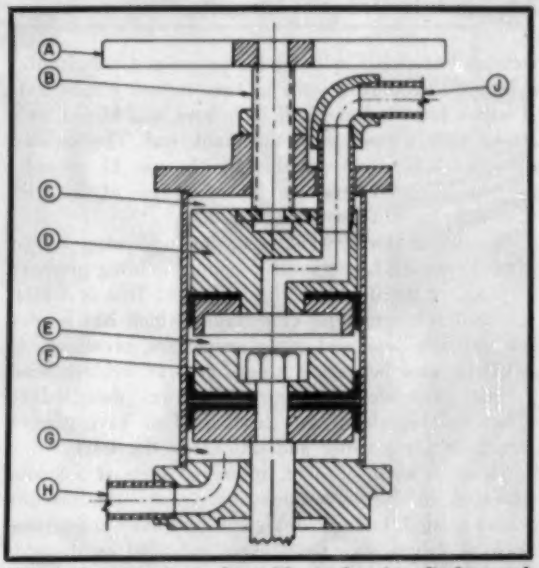
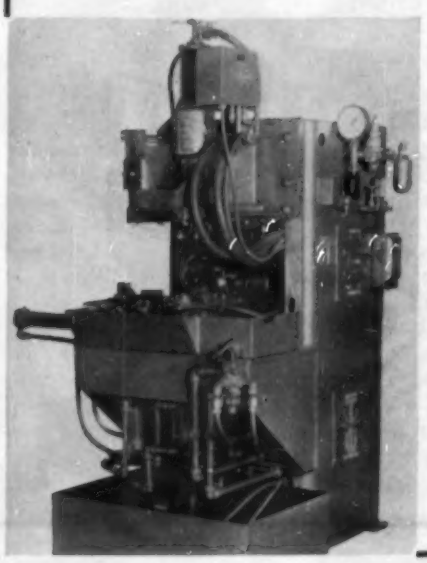
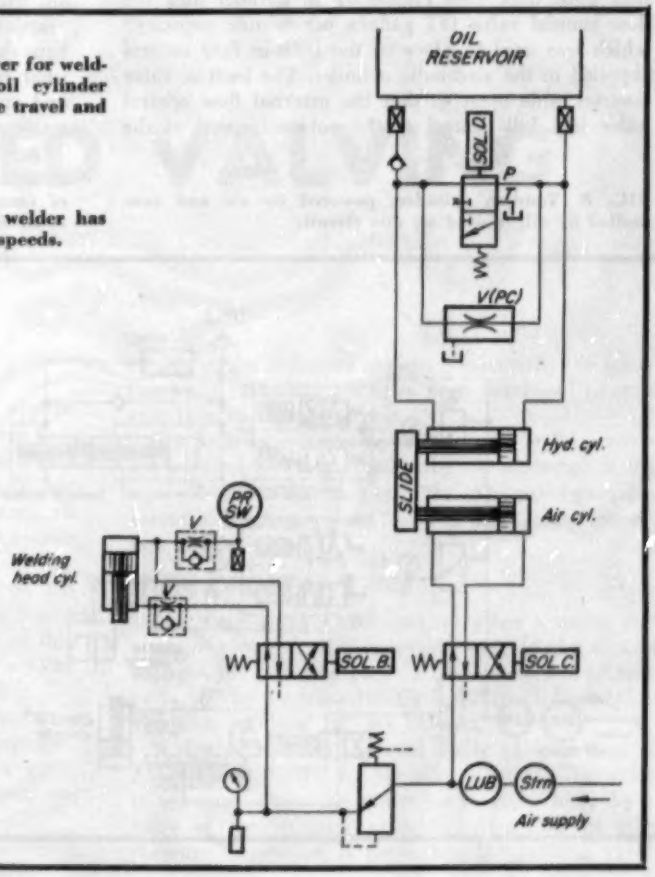


FIG. 4. Design of an adjustable stroke air cylinder used to apply pressure to the welding electrode. (D) is a dummy piston whose position in the cylinder is controlled by the screw (B), with hand wheel (A). The space (C) is inoperative. Piston (F) operates in the air chambers (E) and (G) with ports as shown (J and H). The position of (D) can be adjusted from C = O to E + G = O.

FIG. 5. This welder circuit uses air power for welding pressure and slide travel. The oil cylinder attached to the slide regulates the slide travel and smooths the motion of the slide.

FIG. 6. Designed in 1943, this seam welder has a circuit which provides two forward speeds.





consisted of an air cylinder for power and a hydraulic cylinder for control, built in line on one piston rod. It had a four and one half inch bore and fifteen inch stroke with a cushion at the blank end. The smaller diameter was made possible by the use of an anti-friction mounted carriage, (A), in place of the friction slide here-to-fore used.

Second, a new type of single acting spring return air cylinder, (E), was used to supply welding pressure in place of the double acting cylinder. This is a long stroke diaphragm type of cylinder which has a very low friction loss and gives consistant pressures. It could be used because a hinged type of welding head (upper electrode mounting) (F), was designed to attach to the end of the carriage. This gave greater clearance for loading and unloading the work.

Third, a more efficient, improved type of solenoid operated air valve was designed into the circuits where needed. Fourth, all air and hydraulic accessories such as valves, gages etc., were mounted on the outside of the machine for better accessibility.

To meet the required rate of outward travel or welding speed of 15 to 150 ipm, it was necessary for the airdraulic cylinder manufacturer to furnish an extra run-around oil line connection between the cylinder ends. In this installation it was found desirable for best operation to break this run-around line and connect both lines (see Figure 8) in parallel thru the flow control valve (11 gallons per minute capacity) which was used in place of the built-in flow control supplied in the airdraulic cylinder. The built-in valve was set wide open so that the external flow control valve had full control of the outward speed of the carriage. The return rate of travel obtainable was a little better than 200 ipm, which was considered satisfactory. The air pressure for most satisfactory operation was found to be from 60 to 80 psi. Below 60 psi gave a sluggish action.

A comparison of Figures 2 and 9, which show the old and new versions of a machine made to perform practically identical functions, illustrates what is perhaps the most important feature of the design. It shows what can be done to improve efficiency, accessibility and appearance by making use of the modern pneumatic and hydraulic devices now available.

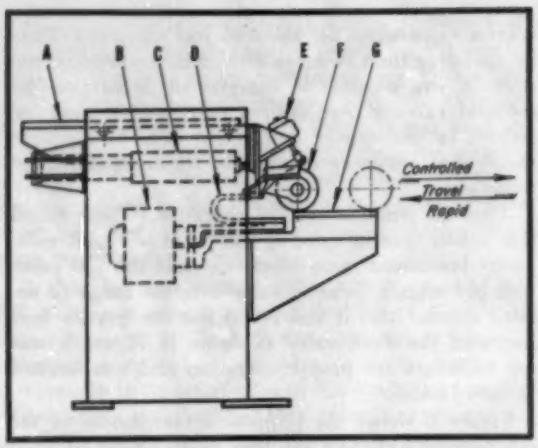
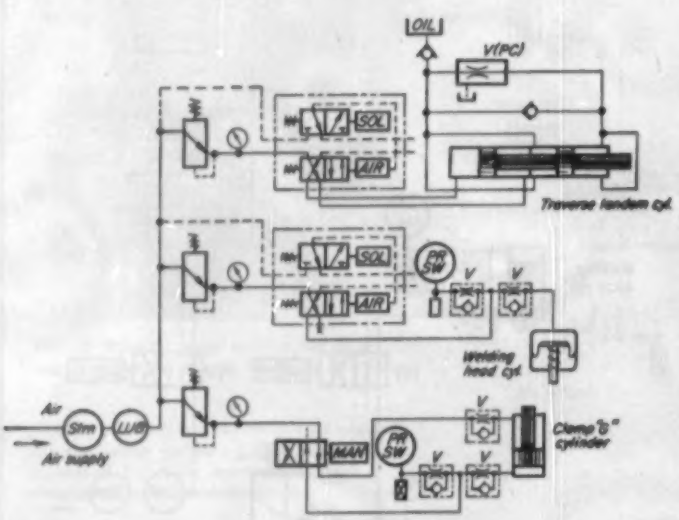


FIG. 7. General layout of the welder which was designed in 1951: (A) carriage, (B) transformer, (C) tandem cylinder, (D) flexible conductor, (E) diaphragm cylinder, (F) roller electrode, (G) stationary electrode.

FIG. 8. Tandem cylinder, powered by air and controlled by oil, is used on this circuit.



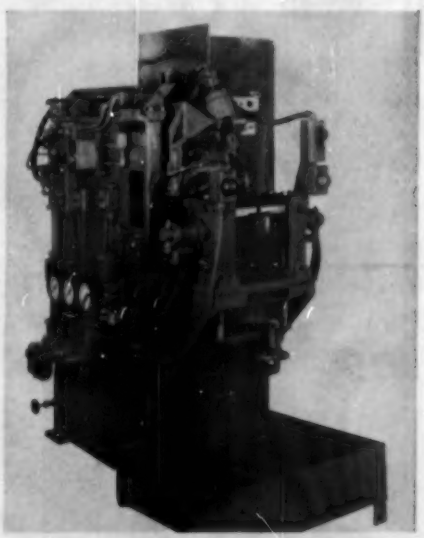


FIG. 9. Design of the latest model shows the grouping of components to improve efficiency, appearance and accessibility.

FIG. 1. TYPICAL double acting press on which the compact valve assembly is anchored to the tank on top of the press.

Reduction of pressure variations is one of many gains you can expect when you work toward . . .

SIMPLIFIED VALVING

By Louis Zimmerman

LONG, successful operation of a hydraulic system requires a valving arrangement which reduces to a minimum the pressure fluctuations in a hydraulic circuit. On press installations where work loads are usually heavy and hydraulic shocks can be severe, all efforts should be made to reduce piping and reduce the number of separate valves in the system.

A rigidly mounted valve assembly is used on the double acting press shown in Figure 1. Figure 2 is a photograph of a valve unit and cross-sections of this unit appear in Figures 3 and 4. Application of a valve unit is shown in the circuit schematic, Figure 5.

The cycle of operation of most presses is comparatively simple; involving a rapid approach, a squeeze, decompression and return. While there are a great many variations in construction between presses, operation of the hydraulic circuits is essentially the same. Construction techniques have been developed to provide improved press service.

The hydraulic operating units shown in this article are used on Clearing presses. Rigidly anchored to the reservoir above the main ram, the valve panel provides a central mechanism and permits quick, easy inspection and adjustments.

LOUIS ZIMMERMAN, Assistant Chief Engineer, Clearing Machine Corporation, Chicago, Illinois

Main Four-Way Valve

The main 4-way directional valve has a spring and pressure centered pilot operated spool. In the neutral position the pressure port "P" is connected to tank ports "D" by the cross-drilling in the spool. Both cylinder ports "A" and "B" are blocked.

A double solenoid operated 4-way valve is used as a directional control for the pilot pressure. This valve is separated from the main 4-way valve body by a valve adapter subplate, cross-drilled so that the pilot pressure connection is made into the holding valve.

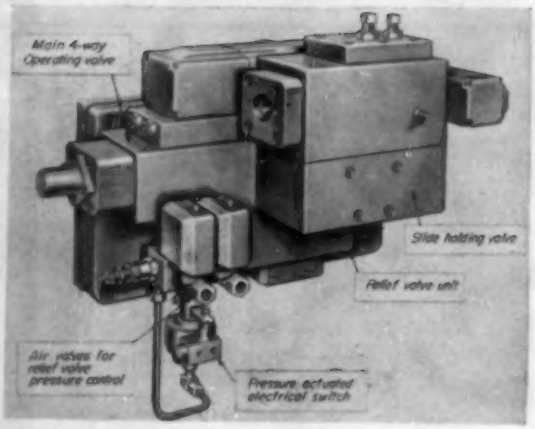

Main 4-way Operating valve
Slide holding valve
Relief valve unit
Air valves for relief valve pressure control
Pressure actuated electrical switch

FIG. 2. VALVE ASSEMBLY for a single acting press. Each valve body is a solid forged steel block with all chambers and ports bored from the solid. Valve spools are of steel with chrome plated surfaces. Standard valve parts are used for pilot operation of the main valve and holding valve. This valving controls the motion and pressure on the main ram and the pullback cylinders.

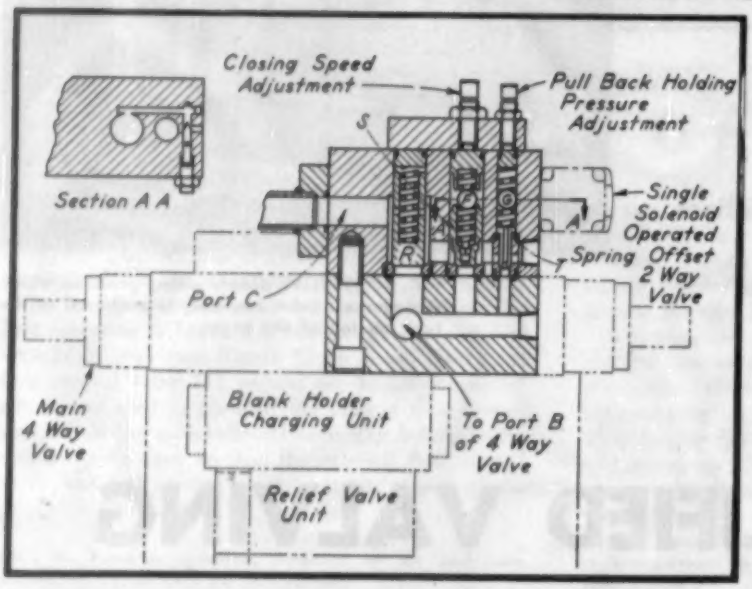

Closing Speed Adjustment
Pull Back Holding Pressure Adjustment
Section A A
Single Solenoid Operated Spring Offset 2 Way Valve
Port C
Main 4 Way Valve
Blank Holder Charging Unit
To Port B of 4 Way Valve
Relief Valve Unit

FIG. 3. HOLDING VALVE on the valve panel for a double acting press. As the press ram and pullback cylinders close by gravity, speed is adjusted by the setting of spool F. When the ram is up, spool prevents the slide from drifting down due to any leakage of oil past the main 4-way valve spool. A solenoid operated shut-off is energized to start the press closing cycle.

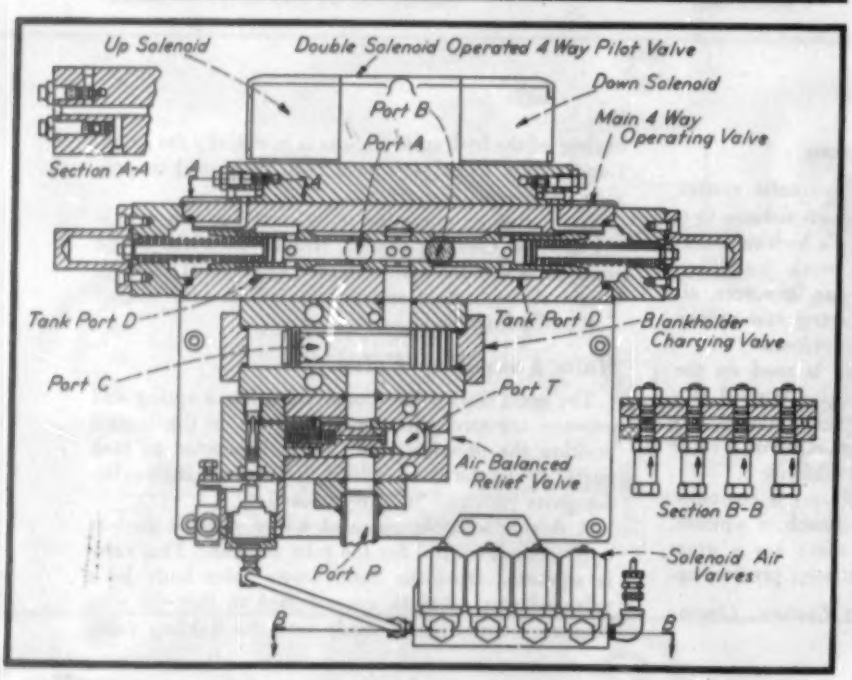


FIG. 4. HYDRAULIC VALVE panel for a double acting press includes the main operating valve, the blankholder charging valve, relief valve, and the holding valve seen in Figure 2. Solenoid operated air valves mounted on a bracket at the bottom of the panel are used to select a maximum pressure setting for the air balanced relief valve. The main 4-way valve has a spring and oil pressure centered spool which has a neutral position of pump open to tank and both cylinder ports blocked.

The tank port is connected to the tank by means of cross-drilling through the mounting plate.

The valve adapter subplate has two adjustable spring loaded needle check valves, one pair for each end of the main 4-way valve spool. One needle valve controls the speed with which oil can enter the end chamber of the spool and the other controls the rate at which the oil can be expelled—thus giving a very simple and adequate means of controlling the shifting speed of the main spool.

With both solenoids deenergized, pilot pressure is directed to both end chambers of the main spool. This is one of the added features of this valve—the fact that it is not only spring centered, but also pressure centered. If for some reason pilot pressure is lost at any time, the spring centered spool will automatically return to neutral sending the main pump volume to the tank.

Energizing the down solenoid applies pilot pressure to shift the spool to the right connecting port "P" to port "A" and port "B" to tank ports "D" through the cross-drilling in the spool.

When the down solenoid is deenergized, both pilot ports are under pressure to put both ends of the main spool under the same pressure. Because of a differential area, the spool is pressure centered, aided, of course, by the spring force. Energizing the up solenoid

. . . integrates air balanced relief valves to provide accurate pressure regulation on press ram

shifts the spool to the left connecting ports "P" to "B" and ports "A" to tank ports "D".

Air Balanced Relief Valve

This relief valve is designed to limit the maximum pressure in the hydraulic system. Excessive pressure is relieved if for any reason pressure is built up in the system beyond a predetermined maximum.

Instead of the conventional spring control, the vent valve on this relief valve is governed by air pressure introduced into a bellows. With no air pressure in the bellow, no restricting force is present on the vent valve. It, therefore, opens to vent the top side of the valve to the tank. The small drilled hole in the head of the piston causes a pressure drop, and the relief valve opens.

The relief valve is set for a particular pressure by means of controlling the air pressure to the bellows.

The air comes to the bellows from a manifold com-

Continued on page 64

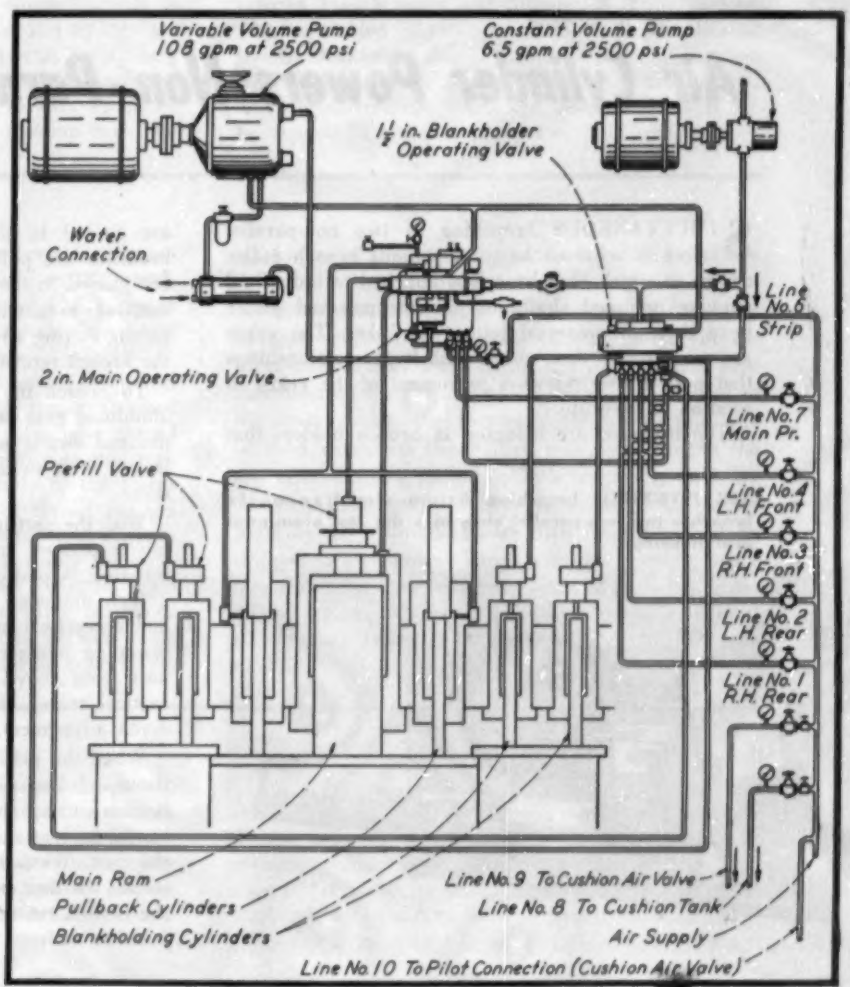
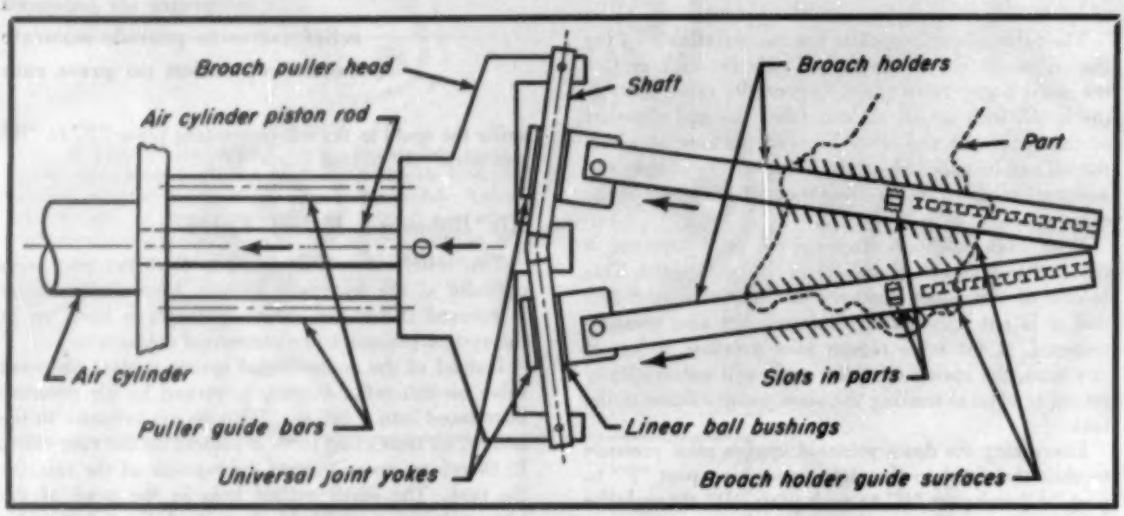


FIG. 5. CIRCUIT for a double acting hydraulic press. The blankholder slide and main ram slide move together on the approach and return. The main ram moves alone during the draw and stripping strokes while the blankholder rests and clamps the blank to the die. Air regulation of the pressure control valves in the blankholder operating valve permits individual adjustment of pressure at each corner.



SCHEMATIC DRAWING of broaching fixture showing how linear ball bushing, universal joint yokes, mounted on individual angular shafts on the puller head permit one air cylinder to pull the guided broaches in angular paths.

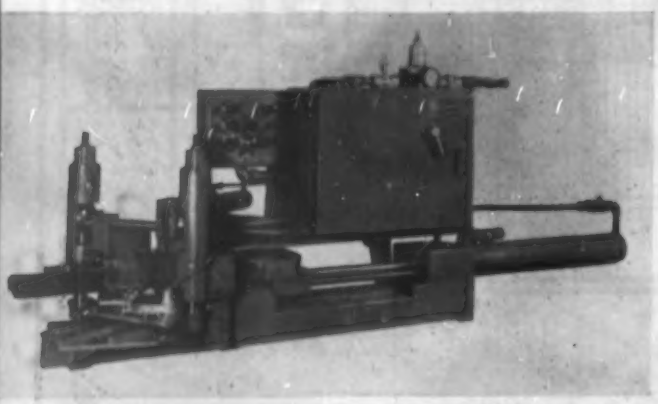
Courtesy National Broach & Machine Co.

Air Cylinder Powers Non-Parallel Broaches

SIMULTANEOUS broaching of two non-parallel slots is achieved by an ingenious broach puller design in which each broach is attached to individual angular mounted shafts on the air powered puller head through universal joint type yokes. The yokes are mounted on their shafts with linear ball bushings that permit free sideways movement of the yokes in relation to each other.

The broaches are mounted in broach holders that are guided in slides above the part. Thus, as the broaches are pulled through the angular slots, they are guided in the correct angular paths and the yoke members mounted on the puller head can spread apart on the cutting stroke and move toward each other on the broach return stroke.

AIR POWERED broaching fixture simultaneously broaches two non-parallel slots in a die cast aluminum gear housing.



To broach the two $\frac{1}{8}$ x $\frac{1}{8}$-in slots in a die cast aluminum gear case cover, it is loaded over a locating pin and swung under the broaches against an interlocked limit switch that indicates correct radial location.

With the part in correct position, the cycle start button is pressed and an automatic broaching cycle is initiated. A platform carrying the part is raised by a 2 inch diameter air cylinder-controlled rack, pinion and eccentric cam mechanism; and a spring loaded clamping plunger locator enters another hole in the part from above. An adjustable stop controlling the vertical travel of the platform provides the broach depth adjustment.

When the platform reaches the end of the vertical travel, another switch is contacted which initiates the broach cutting stroke. A 4 inch diameter air cylinder on the end of the fixture pulls the broaches through the part. When the broaches reach the end of their stroke, another switch is actuated, the platform drops, the broach returns to its initial position, and the part is unloaded from the fixture. This cycle takes 8 seconds.

FLUID LINES and FITTINGS for mobile equipment

By J. E. Jass
Caterpillar Tractor Co.

FLUID lines and fittings on modern earthmoving equipment are designed to carry hydraulic fluid at pressures up to 1500 psi and fluid velocities to 15 fps. The lines must also withstand shock loadings as high as 3000 psi. Pipe, tubing hose and fittings are available today to permit building systems having very small leakage. We have had earthmoving machines, operating under their usual rugged service, which required only six quarts of leakage makeup for 1000 hours of operation.

At least four types of fluid carriers are in common use on earthmoving units. 1. Black iron pipe with tapered pipe threads and fittings; 2. Tube carriers with assembled elbows and fittings; 3. Seamless or welded steel tubes shaped to the proper configuration with welded flanges provided with "O" ring joints; 4. Hose assemblies. Often the designer finds it advantageous to use several types of fluid carriers.

Pipe and Threaded Fittings

Sections of pipe with tapered pipe threads, and various elbows and fittings, usually joined to the actuating cylinders by high pressure hydraulic hose, are in common use, and can be made a reliable means of joining the various hydraulic elements.

To get leakproof joints, it is necessary to control the threading taps and dies and closely inspect finished parts. The introduction of the Dryseal pipe thread has played an important part in improving this type of fitting and piping. Proper assembly of the pieces is important. Variations in length of thread engagement make it necessary to compensate for these changes if lengths of units are critical. Disassembly for servicing is generally not easy, and care must be exercised in joining various pieces to produce leakproof joints. Too often assemblers attempt to do with some type of plastic pipe sealer what should be done in the machining of the parts to provide tight fluid carriers.

The first cost of this type of fluid carrier is probably the lowest of the types discussed here. Availability of replacement parts is also excellent. Most of the pipes and fittings used are of the extra strong pipe classification for the 1200 psi pressure range. One of the most troublesome factors in the use of this type of fluid carrier is the bother with leaks during the test after the first assembly. This frequently calls for complete disassembly and replacement of the faulty parts before a unit can pass final inspection and be shipped to a customer. Faced with this problem many manufacturers have changed to one of the other methods of piping. However it is entirely possible to build reliable and well functioning machines with this type of fluid carrier if these problems are overcome.

Tubing and Compression Fittings

The second type of fluid carrier used frequently on oil powered earthmoving machinery, combines seamless or welded steel tubing with assembled fittings and elbows. Some of these fittings use metallic parts throughout while others include gaskets or sealing elements of various materials such as rubber and plastics.

The tubing is usually steel of the SAE 1015 type that can readily be formed cold. Since the tube ends do not function as a part of the joint, the length tolerances are not critical. Most uses of this type are in sizes of tubing under one inch. In these sizes, the wall thickness for pressure lines is usually around .090. Assembly is important in most of these designs, since

Layout of piping systems on mobile equipment calls for the usual engineering compromise. While lines must be accessible for servicing, they should not be placed where an obstruction can rip them off.

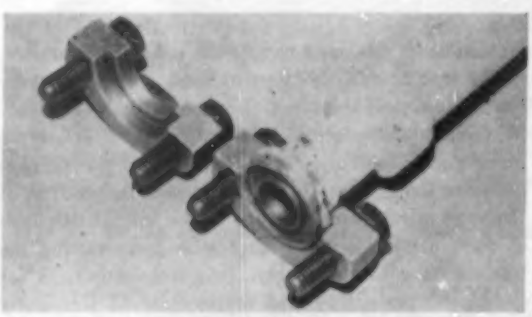
some type of sleeve, collar, or sealing element is being clamped or squeezed into place during the assembly. Proper control of tubing o.d. and surface finish is necessary. The final check on holding hydraulic fluid under pressure comes only after final assembly, and in case of leaks, disassembly and adjustment are not too easy. Field servicing of this type of fluid carrier calls for occasionally breaking the joints and producing leakproof units after this work is done. In some cases this calls for replacement of certain portions of the fittings or sealing sleeve to do a complete job.

Fittings are made of steel, bronze, aluminum, or malleable iron and are produced with high production totaling, so that they can be priced attractively. In the larger sizes, from one inch tube size and up, the fittings are somewhat large and cumbersome, but this type of fluid carrier properly designed and applied makes a very reliable part of any hydraulic system. Since most of the joints are made with straight threads, it is possible to eliminate any plastic thread sealers.

Tubing and Welded Fittings

The third general type of fluid carrier uses seamless, or welded steel tubing with flanges, junction boxes, elbows, or joining sleeves welded or brazed to the tube, and using bolts or capscrews to join these fluid carriers to the various parts of the hydraulic actuating unit. The joint between tube assemblies and the other elements is usually provided with an "O" ring or a special gasket.

There are several different combinations of parts. One is a tube assembly with welded flanges at each end which can be used very well where two joining parts have a definitely fixed relationship to each other, or where the one end can be "wild" as to location, if the parts on the wild end can be allowed to be located by the tube assembly.



Sleeve end of tube assembly with four bolt split clamp. Tube assembly having welded end flanges.

A second combination uses a tube assembly having a sleeve welded in one end with a split four bolt flange on the sleeve. The split clamp design provides a desirable flexibility that is not found in solidly welded flanges.

Another design combination uses a solidly welded flange on one end of the tube assembly with the insert for a reusable hose and welded directly to the tube. This is an extreme case, where dimensional problems necessitated making a hose assembly actually an integral part with the tube assembly. It probably would not be considered best design to make a hose an integral part with the tube assembly, but frequently fluid carriers must be designed into a unit after most other design problems have been taken care of, and it becomes necessary to resort to combinations that are not exactly ideal.

On some applications a welded tube assembly is bolted to a regular hose assembly. When the two ends to be joined by the tube assembly cannot be controlled as to location, the flexible hose unit is needed to keep from breaking tube assemblies during assembly or service.

There are also many cases where frame deflection during service dictates use of a flexible member on end of a tube assembly. Many field failures have resulted where a rigid unit was used when severe deflections of machine members were met.

In this type of fluid carrier, the basic tube is of SAE 1015 seamless steel tubing. The wall thickness for most pressure carrying units is $\frac{1}{8}$ in. and for suction lines, 1/16 in. The sizes vary with the unit capacity starting at $\frac{5}{8}$ in. o.d. and ranging up to $2\frac{1}{4}$ in. o.d. Recent trials of welded steel tubing have been successful, and with the accumulation of additional service hours and production test lots now in the field, it may be possible to use it more generally in this service.

One of the problems that needs to be solved in welded steel tubing for this application is the complete removal of the flash on the i.d. of the tube.

The use of seamless steel tube has been completely satisfactory, and it is only the cost factor that makes us look for any substitute material.

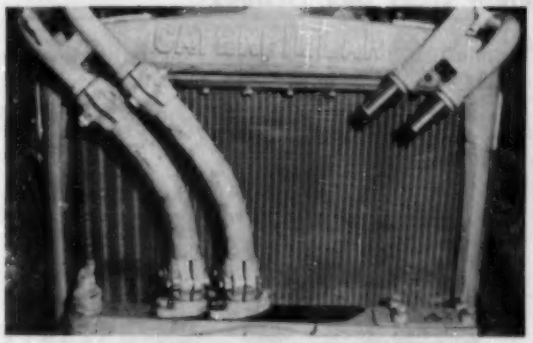
The end elements on the tube assemblies are flanges, elbows, sleeves, or junction blocks. The flanges are usually stamped, cast, or forged. The elbows are cast or forged and provide almost endless variations in the configurations that can be used. The sleeve ends, made as screw machine parts, including an "O" ring groove, are used in numerous applications. We particularly like the sleeve end with the split four bolt clamp, since it provides an easily manufactured unit, with some degree of flexibility as it does not require the critical aligning of bolt holes and clamping faces.

All of the tube bending that is necessary is done by a rolling operation without any heating. The cold bending keeps the inside of the tube perfectly clean and eliminates the cleaning that would be necessary to remove the scale if hot bending were used.

The end flanges, sleeves, or elbows are added by electric arc welding. In most cases this calls for their being assembled previous to the welding in tacking fixtures to insure proper "fit-up". Welding methods must be controlled carefully to provide joints that will pass inspection pressure testing at 1500 psi.

In most cases the assemblies are machined after welding so as to produce flange faces with the necessary degree of flatness and squareness to work properly with "O" ring seals and to match up with faces on junction blocks, hydraulic units, and manifolds. In some instances, where the bolting members are of sufficient size and thickness or where the welded joint comes quite a distance from the machined face, we have found it possible to do the machining before the welding.

The cost of this type of fluid carrier is high, but it makes up in reliability and speed of assembly and servicing for a good part of this additional cost.



Welded tube assembly with reusable hose end welded integral with tube.

Welded tube assembly joins flexible hydraulic hose-when the location of the connected components can not be controlled.

Hose Assemblies

Regardless of the type of metallic fluid carrier used, it is most always necessary to have a number of flexible hoses used in every design. Tremendous strides have been made in the design and manufacture of high pressure hydraulic hose, so that today the number of failures occurring in the flexible fluid lines is very low. If the design factors for high pressure hydraulic hose are observed, a very reliable unit can be built. We have a number of applications in our hydraulic bulldozers where it has been possible to locate the hoses in the well protected part of the machine, and even in the very rugged pioneering service in which a large crawler tractor-bulldozer combination usually operates, we have several case histories in which the original hoses served for 8,000 to 10,000 hours without replacement.

It is not always possible to position high pressure hydraulic hoses in well protected parts of the machine, and some of the failures of hoses are perhaps more closely associated with mechanical failures than with hydraulic problems.

The hose and fittings industry has been active in providing many varieties of hose ends and connections to simplify applying fluid carriers to hydraulic tools. The designer presently has a large number of angled and straight fittings with which he can solve some of the piping problems much more easily than five years ago. These fittings are available using pipe threaded ends, or the bolted flange type with "O" ring seat. It is also possible to choose either permanently swaged ends for the hose assemblies, or to use a hose that has replaceable and reusable ends that are satisfactory for the whole pressure range.

Both the permanently swaged hose end and the reusable end are in common use in earthmoving tools. The permanently swaged end type is somewhat less expensive, and perhaps somewhat neater, but the reusable end hose provides a great advantage in field service work since it is possible for a customer, or a distributor, to immediately provide a hose assembly of any given length and size out of a minimum number of pieces carried in stock. Hose is carried in coils, and fittings can be reused out of the replaced hose.

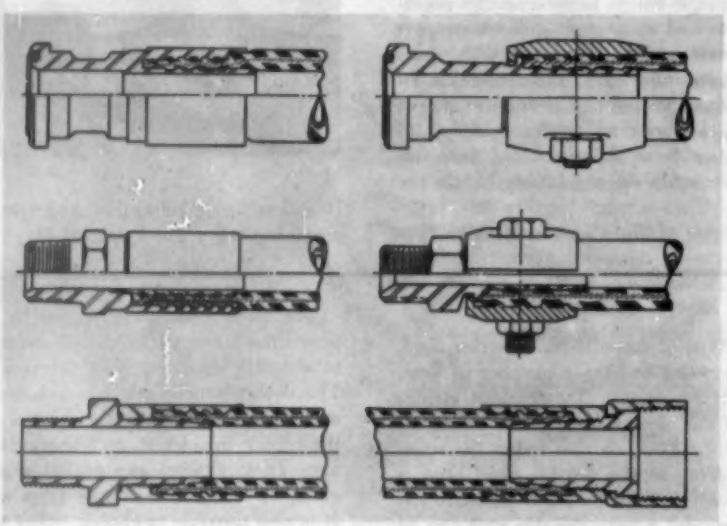
The unit is put back into service quickly, whether or not the hose assembly of a certain length is available. The reusable ends are a completely satisfactory unit for this pressure range, and are not merely a service "crutch". We have been using them as original equipment on our entire bulldozer line for the last six years.

This article has been adapted from a paper presented at The National Conference on Industrial Hydraulics, October 1953.

Elements used in one reusable hose.

Elbows and fittings available in hydraulic hose assemblies.

Hose ends showing: permanently swaged end, reusable ends, "O" ring joint, tapered pipe thread ends.



1954 Prize Paper Contest

A number of requests for Entry Blanks, Rules of the Contest and Suggestions to Contestants have already been received for the 1954 APPLIED HYDRAULICS Prize Paper Contest. The Contest is being conducted on the same basis as last year's successful competition.

The scoring system developed jointly by the judges and the editorial staff in last year's Contest will again be used. The scoring is based on an average of the judges' evaluation of four factors: practicability (30 percent); economic gain (30 percent); degree of originality (20 percent) and clarity of presentation (20 percent).

The same major prizes of $500.00, $300.00 and $200.00 will be awarded, with four prizes of $50.00 each.

Early entries in last year's Contest won a good share of the prizes. Address the Contest Editor for your Entry Blank, Rules and Suggestions.

Huge axial piston servo controlled pumps power 18 inch tube reducing machine

Will 2300 gpm - 3000 psi Pumps Open New Fields?

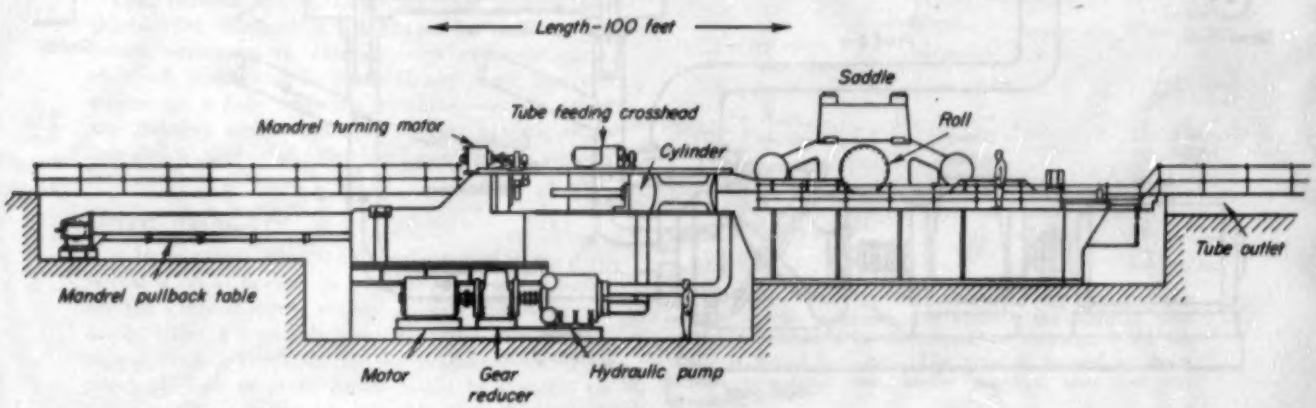
THE 18 inch tube reducing machine now being built by the E. W. Bliss Company for a Bureau of Aeronautics facility which will be operated by the Tube Reducing Corporation, Wallington, N. J., will be by far the largest machine of its type ever built. Since the largest previous tube reducer took a 6-½ inch OD incoming tube, when placed in service in 1954, the new machine will produce a range of sizes hitherto unavailable. The necessary precise control plus rapid reversals under heavy loading, led to the selection of a hydraulic drive. To accomplish the job two of the largest axial piston, variable displacement, reversible angle plate type pumps ever built were designed and built for this machine.

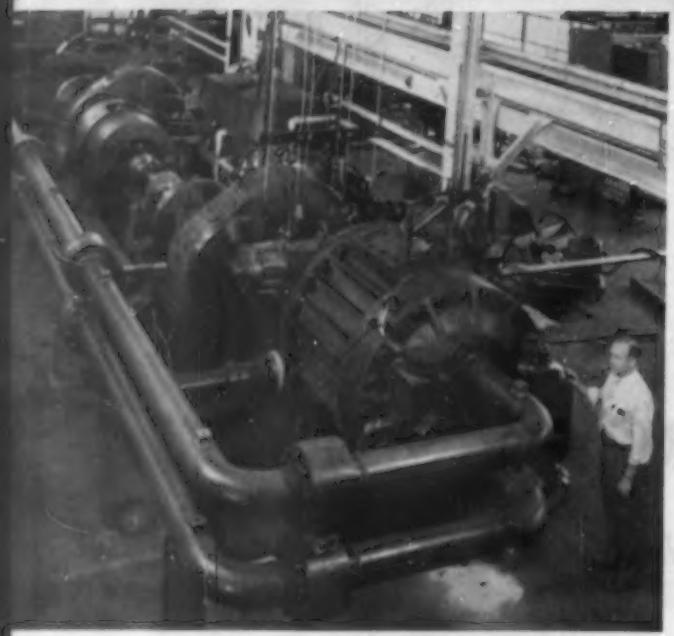
When completed the tube reducing machine will be more than 100 feet long. The tube reducer will have four principal sections: (1) roll housing or saddle at one end; (2) tube feeding and turning equipment, in the center; (3) the drive asembly; and (4) the mandrel handling mechanism, at the other end.

Roll Housing or Saddle

The saddle, the heart of the machine, resembles a 50 inch mill roll housing equipped with four 36 inch wheels, which support it from rails seven inches above the pass line. The saddle is driven reciprocally by

NEW GIANT 18 inch tube reducing machine will be over 100 feet long. It will produce a range of sizes of high strength, thin wall tubing for aircraft applications previously unavailable. Four major sections, left to right are: mandrel handling equipment; tube feeding and turning units; drive assembly; and roll housing or saddle section.





NEW 2300 gpm pumps are shown being readied for test. Each pump weighs more than 20 tons.

two double acting cylinders, each 13 inches in diameter, with double 7 inch piston rods. This reciprocating motion is changed to a rocking motion of the tube rolls by two drive gears in mesh with stationary racks. The top roll is driven by gears on each end of the roll shaft; the gears engaging the stationary racks. Synchronizing gears, toward the center of the top roll gears, engage in similar gears on the bottom roll to drive it and to assure synchronous motion with the top roll.

The bottom rolls are vertically adjustable by hydraulic cylinders. Preloading these cylinders maintains the position of the bottom roll during the rocking operation. Quick dumping valves protect these cylinders from accidental overloading.

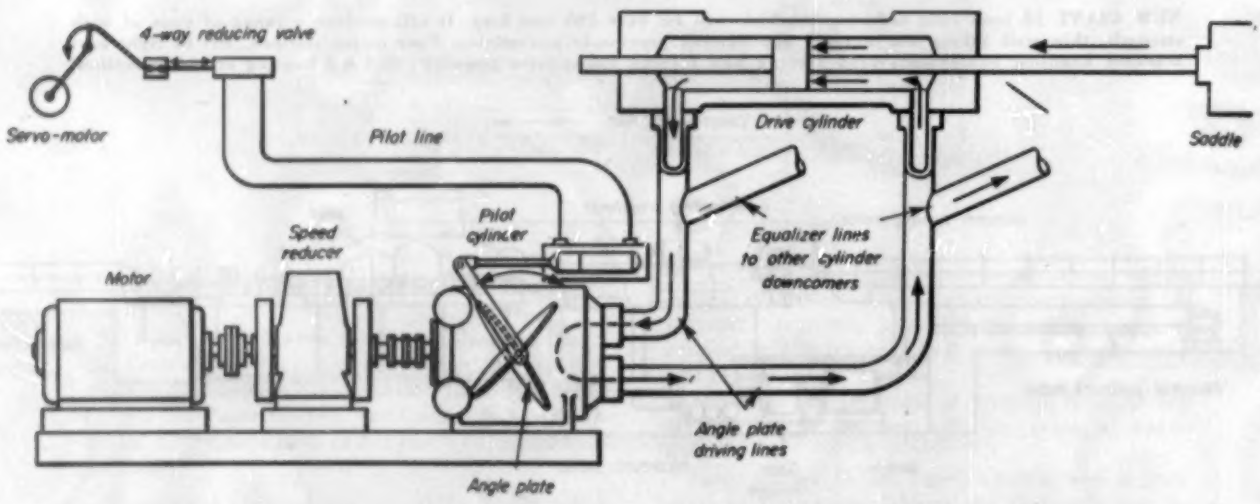
Final size of the rolls—50 inches—was determined by the center distance required to permit the use of roll neck bearings of a size required to support the rolling loads of approximately 3-½ million pounds. As the rolls are not sufficiently rigid to prevent flexing, this is compensated for in the pass design. Double roller spherical bearings are used to permit such flexing. The bearings (48.035 in OD, 17.244 in wide and load rating of 3,200,000 pounds) are the largest capacity ever produced in this type bearing. The tapered bore of the bearings matches that of the roll neck so that the bearings can be placed with pressing, expanded by hydraulic pressure, drawn into proper position on the roll necks, relieved of pressure to properly preload radially, resulting in a "shrink" fit without benefit of heat or presses.

The use of insertable dies reduces the cost of tooling for each size and taper and permits the changing of passes on the machine without a complete change of rolls. The dies, which weigh 7500 pounds each, are held in the roll by four 3 inch corner bolts. Forces which tend to push the die out of the roll are balanced out by tapered keys along the periphery, wedged between the die and roll so as to resist the splitting forces on the groove.

Tube Fitting and Turning Equipment

A tube being rolled cannot be allowed to move forward freely in the roll pass; any such uncontrolled

SCHEMATIC arrangement of one-half of the drive circuit. Each drive cylinder has its own pump; the equalizer lines coordinate piston movement. Pumps are controlled by servo-motors through pilot cylinders to regulate variation of pressure and reversal. The angle plate is in the fully open position to deliver maximum flow.



movement would cause the tube to jam into the dies. A vise on the crosshead secures the tube on the side away from the rolls. The crosshead contains a hollow spindle through which the mandrel rod passes. The crosshead is a large carriage and can be run toward or away from the rolls. For feeding tubing into the rolls preset increments in a range of .1 to .5 inch can be selected. This advance is timed by cams so that each increment of feed is made immediately prior to each forward work stroke of the rolls at the moment the saddle is at a stop to reverse direction. Powered by a 200 hp hydraulic feed motor, the crosshead can be run at a speed up to 70 fpm, forward to push the tube into the machine, backward, to get out of the way to load another tube.

The tube being worked is turned at three points: at the crosshead vise, at a second vise on the outlet side of the machine and by means of the mandrel. Vises and mandrel are turned in unison through a 60 degree arc by a 35 hp hydraulic motor (turn motor).

The mandrel bar must be withdrawn in order to load a new tube into the machine. The bar is then re-inserted through the newly loaded tube. This is accomplished by a slide on which the rear end of the mandrel bar is mounted. The slide is pulled back by a heavy chain, hydraulically driven at the rate of 75 fpm. As the positioning of the mandrel bar is quite critical in determining precisely the inside diameter and the wall thickness, it is locked in place with a pair of hydraulically actuated slides which push the bar forward against a stop which is adjustable to very close limits.

In addition to the 18 inch tube reducing machine, a 10 inch machine is also projected. Preliminary design investigation was limited to the 18 inch machine since it was considered that the smaller machine would more or less be a scale model. The 18 inch machine will be capable of using raw tubing from 10 to 18 inch OD to produce precision seamless tubing from 9 to 16 inch OD. The 10 inch machine, similarly, will accept raw tubing from 6 to 10 inch OD and produce finished tubing from 5 to 9 inch OD. Wall thickness as light, if not lighter than .125 inch in 10 inch tubing, .175 inch in 14 inch tubing and .200 inch in 16 inch tubing are anticipated.

Cold reduced tubing, roll-compressed in such machines offer outstanding advantages for making cylinders, accumulators, casings, large ring-type parts, etc. Such tubing can be made of any metal that will reduce on a tube reducing machine—carbon, alloy and stainless steel, aluminum, copper, brasses, titanium and a number of other less known metals coming into use.

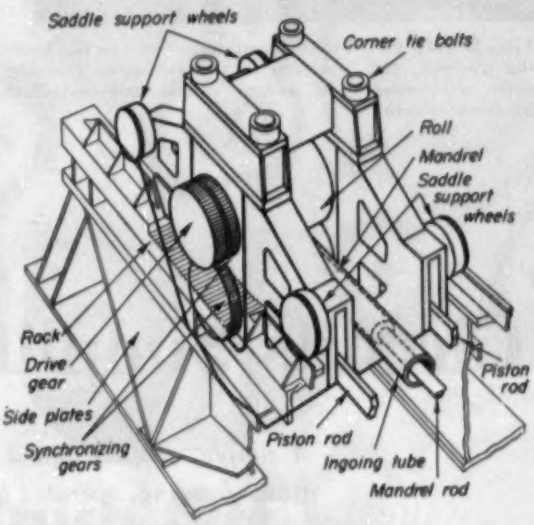
Drive Assembly

A basic specification for the tube reducing machine is that it be as flexible as possible so as to be usable for the greatest range without modification. For example, when a relatively small reduction is required, only a limited length of the die periphery would be required. Two or more passes might be possible on one die. Or, it might be desirable to make a long, tapered tube by changing the length of the stroke at a controlled rate as the tube is fed into the machine. For these reasons the drive must have the following characteristics:

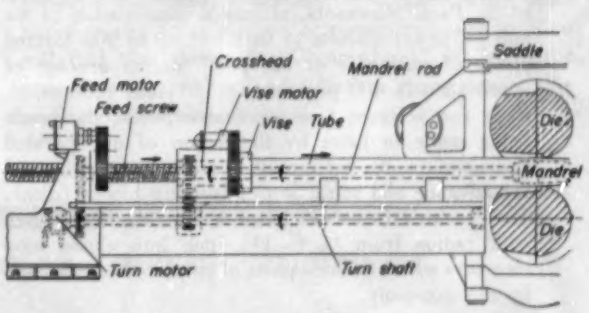
(1) The stroke should be variable in length
(2) The position of the shortened stroke in respect to its location on the full stroke should be alterable
(3) A means of progressively shortening the stroke at a controllable rate should be possible
(4) The speed should be variable as a function of stroke length to provide the maximum productivity

As already noted, a hydraulic drive was selected because of its advantages in being able to give precise control and make rapid reversals practical. However,

Continued on page 62



THE ROLL HOUSING or saddle is the heart of the tube reducer. Reciprocation of the saddle is by movement of two double end hydraulic cylinders, each supplied by one of the 2300 gpm pumps. Two drive gears mesh with stationary racks to impart a rocking motion to the rolls. Synchronizing gears assure uniform movement of top and bottom rolls.



SCHEMATIC sketch of the tube feeding and turning section of the machine. For feeding the tube is held by a vise mounted on the crosshead carriage. Feed advance is timed by cams. The tube is turned at three points, crosshead vise, outlet position vise and the mandrel.

FIG. 1. THE OPERATOR is placing a rod in the loading position, the first step in the automatic forming cycle, performed by air and oil circuits and controlled by limit switches.

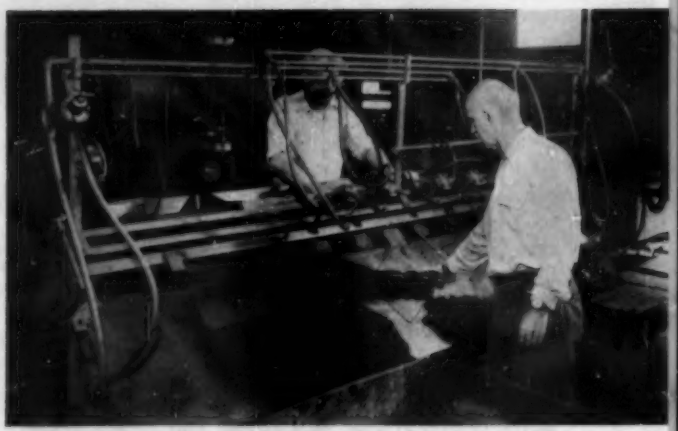


FIG. 2. A ROD, just finished, is being removed from the front of the wire frame bending machine by Walter Graber, master mechanic, the designer of the machine. Method of mounting the four holddowns is shown.

Circuits Simplify Wire Forming

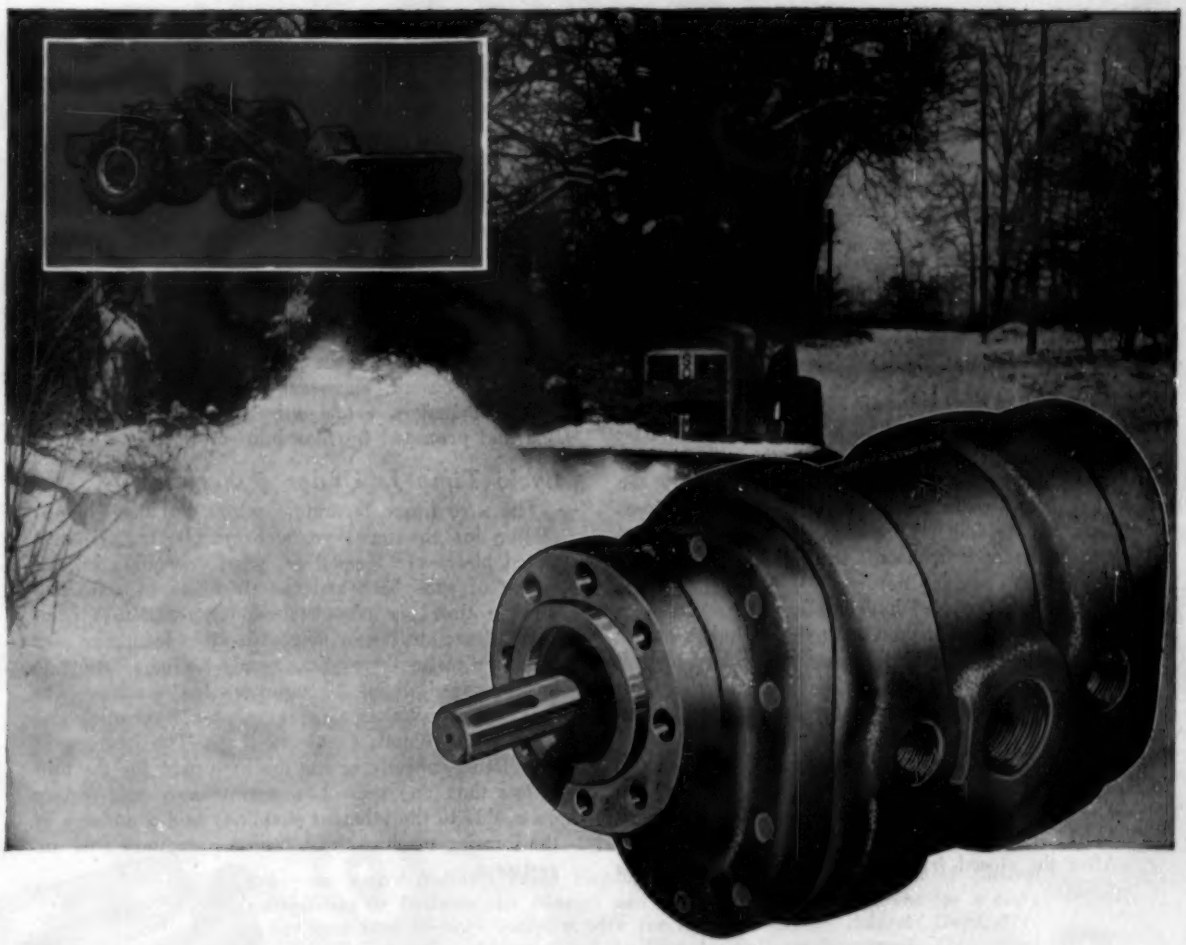
A simple, shop designed and built machine for wire frame bending, operated by air and oil circuits, stepped up closed loop production bending over 400 percent.

A WIRE frame bending machine in the Superior Metalware Division of the John Wood Company of St. Paul, Minnesota, utilizes a combination of air and oil power circuits to turn out up to 900 formed pieces of steel wire or bar per hour, an average of approximately 400 percent over previous production. Each rod is given four 90 degree bends, the bends being made in pairs by the action of oil operated hydromotors. An air circuit operates holddowns and the advance and retraction of forming blocks (dies). The machine forms steel rod 3/16 up to 9/16 inch with radius from ⅛ to 1¼ inch into closed loop members which become parts of trays or baskets made by this company.

The wire frame bending machine was built on a simple open frame. The four hydromotors are mounted at the rear of the machine, inclined at a 45 degree angle toward the front of the machine frame. The head of each hydromotor assembly is attached to a slide bar (see Figure 1) under the table top. The forming blocks are mounted above the hydromotors on a pair of rails which form the back of the machine top frame. The holddown cylinders are mounted above rails on the top front of the machine frame. Hydromotors, forming blocks and holddowns are all adjustable in position along the slide rod and rails so that a wide range of wire or rod lengths may be formed. Closed loop bends from 6 x 10 to 30 x 30 inches may be made on the machine.

Bending operations are done in pairs, the second pair of bends closing the outer ends to form a closed loop. By a change in the sequence of operation or by removing one pair of forming blocks, a single pair of bends may be made. By changing the positions of the hydromotors, forming blocks and holddowns, bends may be made at uneven distances on the wire or rod when desired.

The operator's position is at the rear of the machine, facing the central control panel. From a supply of rod on the table, he pushes a rod into the loading position. This movement causes the rod to strike a limit switch, closing the four air operated



Winter Gets The Brush Off !

THIS HEAVY DUTY service "Commercial" double oil hydraulic pump develops fluid power to flex the muscles of the fluid motors which operate the brush equipment mounted on this tractor. The entire mounting is as clean as the cleared road which is left.

Two separate pumps, assembled into a single unit, are driven by one through shaft to which the primary driving power is applied. Safe operating pressures up up 1000 p.s.i. can be developed with one pump having ample capacity to raise and lower the cylinders, while the other pump maintains uninterrupted rotation of the fluid motor which turns the brush.

Here again is an application of fluid power controls giving a simplified, lower cost installation when compared to any other method of power transmission. You will find that there are "Commercial" oil hydraulic pumps, motors, valves, and cylinders giving dependable service and working near you.

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Circuits Simplify Wire Forming

holddown cylinders. As the rod is clamped, a second limit switch is closed, causing the outside pair of hydromotors to turn, forming the ends of the rod into two right bends. At the end of the hydromotor movement, limit switches on the hydromotors are closed, raising the outer pair of holddown cylinders, retracting the forming blocks and reversing the hydromotors.

Limit Switch Control

Retraction of the outer pair of forming blocks closes two additional limit switches and energizes the forming stroke of the two inner hydromotors. This cycle repeats that of the two outer hydromotors, freeing the formed rod which falls free (Figure 2) from the front of the machine and the limit switch which was closed when the clamps held the rod in the forming position, returns to an open position.

As the inner pair of hydromotors are reversed to their starting position, another pair of limit switches are opened, stopping the hydromotors and raising all four of the forming blocks. This returns the limit switch which opened to raise the inner pair of holddown cylinders to a closed position. The cycle is complete and the machine is ready to start a new work cycle with the hydraulic system at minimum pressure.

The sequence of operation is given in detail in Table 1.

After the closed frames come off the front of the machine they are butt welded on a table height welder immediately in front of the bending machine (Figure 2).

The hydraulic circuit is confined to the operation of the hydromotors. Power is supplied by a package unit conveniently located at one end of the bending machine. The outside pair of hydromotors are operated by a three position, open center, pilot operated valve; the inside pair of hydromotors are operated by a similar, closed center valve. Both valves are spring centered and equipped with a speed control valve.

The holddowns and the forming blocks are operated by the air circuit. These are operated by double acting air cylinders, actuated by the 100 psi shop air line and protected by filter-lubricators.

Cycle Time Is Under 5 Seconds

The wire frame forming machine has been in operation for about two years. From 600 to 900 completed pieces are formed an hour, depending on the length of rods bent and the thickness of rod. The average time per complete bending cycle has been 4 to 5 seconds. The changeover time from one size of frame to another, or from one radius to another, has averaged about 30 minutes. The machine was designed by Walter Graber, master mechanic, and built in the Woods Company shops. The increase in productive capacity of the machine paid for the unit is less than one year. Low maintenance and service costs, due to the inherent simplicity and soundness of the forming machine, have been a premium on the investment.

TABLE 1. SEQUENCE of operation of air, oil and electrical circuits.

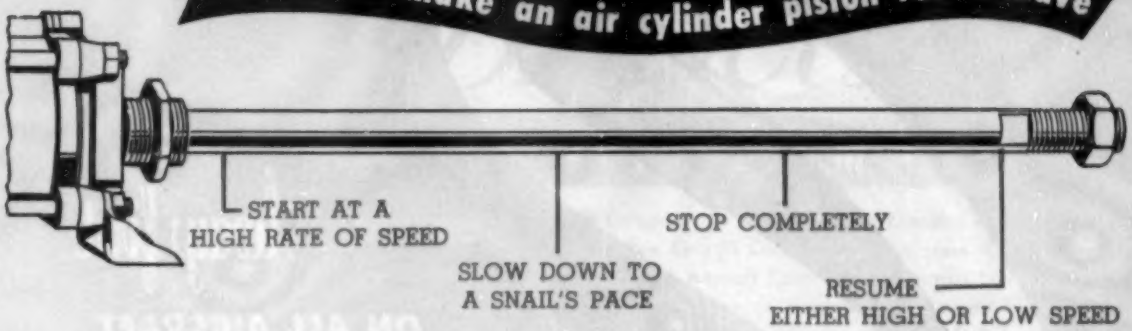
Operation	Electrical Control Circuit	Air Circuit	Oil Circuit
(1) To bring all mechanisms to initial starting position . .	(2) . . push "Stop," "Reverse" and "Forward" buttons in that sequence.		
(3) Operator then drops one wire or rod into loading position under open holddowns . .	(4) . . wire strikes M_1 micro switch which . .	(5) . . actuates 4 holddown cylinders, clamping wire in forming position.	(6) . . outside pair hydromotors (H_1 and H_4) turn. Turning of hydromotors . .
(7) . . first bend as the . .	(6) This closes micro switch M_2 to initiate . .		
(10) . . unclamping as . .	(9) . . closes micro switches M_4 and M_9 to cause . .	(11) . . outside pair holddowns P_1 and P_4 raise and . .	
(12) . . retraction of . .		(13) . . outside pair forming blocks, Q_1 and Q_4, and . .	(15) . . hydromotors H_1 and H_4. Then . .
(14) . . reversal of . .			
(16) . . second bend takes place, having been started by . .	(17) . . retraction 13, closing micro switches M_{10} and M_{11}, completing circuit to S_3, causing . .		(18) . . inside pair of hydromotors, H_2 and H_3, to turn. Then . .
(19) . . retraction of . .	(21) . . closing of micro switches M_6 and M_7 during the . .	(20) . . inside pair of forming blocks, Q_2 and Q_3, is caused by . .	(33) . . hydromotors H_2 and H_3.
(32) . . reversal of . .	(24) This opens micro switch M_3 and . .	(25) . . holddowns P_2 and P_3 raise, then . .	
(26) . . wire drops from machine.	(27) Micro switch M_2 returns to open position and . .		(28) . . hydromotors H_2 and H_3 return to starting position.
	(29) Micro switches M_5 and M_8 are opened, stopping hydromotors.	(30) All four forming blocks, Q_1, Q_2, Q_3 and Q_4, are raised.	
	(31) Micro switch M_3 returns to closed position.		

Notes: To check operation of air holddowns P_1, P_2, P_3 and P_4 only, without starting work cycle, open toggle switch 1 and close toggle switch 2 to bring down holddowns.

To stop sequence of operations with wires to be formed in feeding mechanism, open toggle switch 1.

Skip CHECK — *Stop* CHECK

or how to make an air cylinder piston rod behave



Start an ordinary air cylinder and its natural tendency is to proceed at a fairly uniform rate to the full length of its stroke.

But with this "packaged" air cylinder power unit the piston rod can start its advance at a high rate of speed, slow to a snail's pace when you wish, stop completely at any desired point, and resume either a slow or high speed as you prefer.

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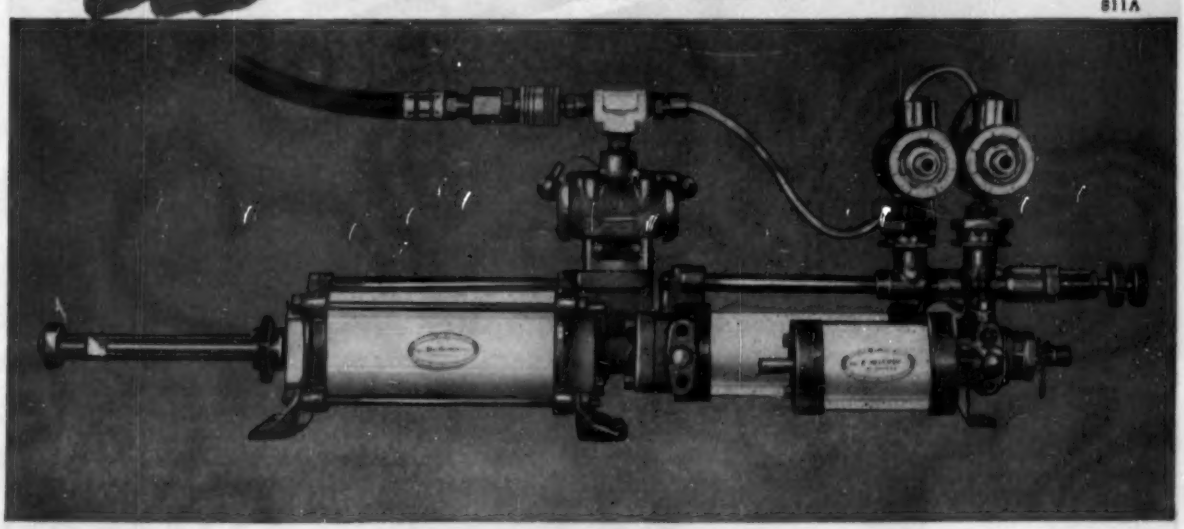

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Design of a Hydraulically Operated Aircraft Windshield Wiper

By C. R. Sacchini

DESIGN of this windshield wiper was developed primarily for use in commercial and military aircraft having suitable hydraulic systems, within the delivery range of from 1100 to 3000 psi. It is now being used on the Boeing B-50 airplane.

This unit contains many interesting phases, the principal novelty of the design residing in the provision of an improved automatically acting fluid motor actuator unit supplied with hydraulic pressure and arranged to divert pressure fluid alternately to opposite ends of a closed loop reciprocating motor mechanism and also to exhaust the spent fluid. Any number of motor mechanisms (window units) can be operated by the fluid motor actuator, provided the window units are connected in parallel. For simplicity, the drawings show two window units.

In event one or more window units become obstructed as by accumulation of ice on the windshield the design enables the remaining window unit or units to continue normal or full stroke operation until the obstruction is removed.

Another feature provides for an improved and simplified window unit which when connected in pairs, or groups in parallel are maintained normally and automatically in synchronism.

Another interesting and important feature is in the motor actuator. The reversing operation is accomplished by the use of two spring biased, pressure operated plungers, so arranged that the fluid pressure built up in the system to a predetermined point causes reversing operation to take place, irrespective of the length of stroke of the window unit pistons.

All necessary manual operations (that is, for starting, wiper speed setting and parking) are performed through manipulation of a single valve, identified as "Speed Control Valve" in the drawing of the unit. A metering orifice in the valve (selected at installation of the unit to match whatever pressure the hydraulic fluid system has) limits the wiper speed to approximately 300 strokes per minute. To park the wipers at stroke end positions the operator has only to close the speed control valve gradually. When the valve has

Hydraulic Windshield Wiper

been fully closed the wipers are both parked and locked.

A factor contributing to simplicity of manufacture is that most of the valve ports and fluid passages are plain jig-drilled holes.

Some advantages over previous hydraulic wiper equipment, but not apparent from the following drawings are:

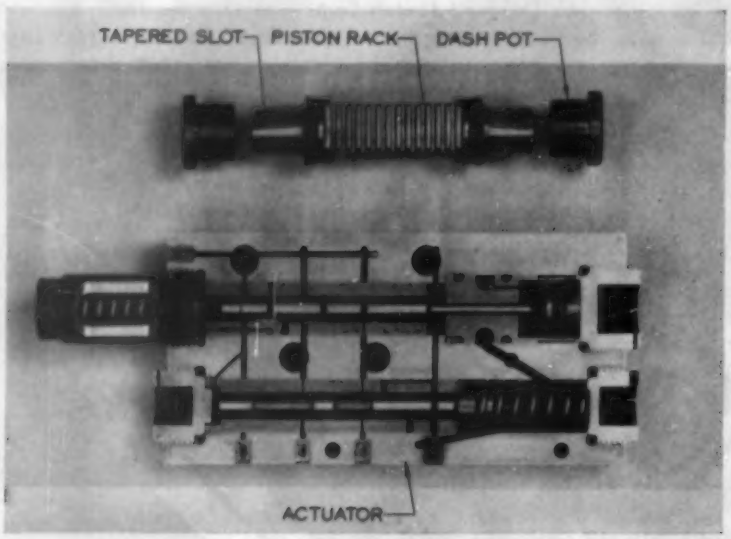
A) The elimination of cumbersome and troublesome push-pull controls.

B) Synchronized blade action can be obtained either in parallel acting or oppositely acting pairs of wipers by mounting one window unit in a 180° turned position relative to the other unit.

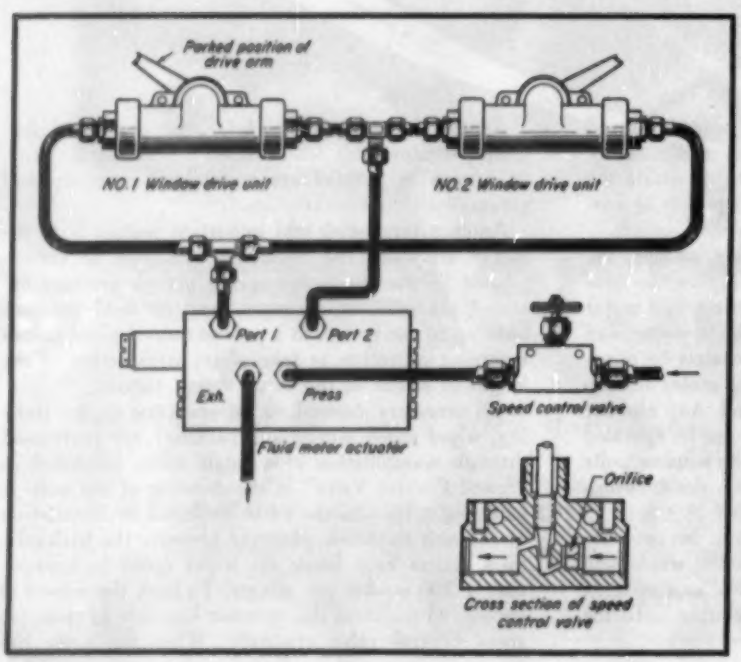
C) Light weight, which is so paramount in any aircraft component design.

D) Much easier installations into the airplane. Because the window units are small and cylindrical in shape, they fit easier into crowded cockpit enclosures. The fluid motor actuator can be mounted in the fuselage in any convenient spot and located remotely of the window units.

E) Sufficient output torque at the window unit to



CUTAWAY VIEW of the reciprocating motor and the motor actuator. The actuator operates automatically to direct pressure alternately to opposite sides of the motor and also to exhaust the spent fluid. The bottom spool of the actuator is a pilot valve; the upper spool is the slave valve. Tapered slots on the reciprocating motor cushion the stroke. The windshield wiper is driven by a pinion which meshes with the piston rack.



LAYOUT DRAWING of the oil powered windshield wiper. Any number of wipers can be connected in parallel and controlled by the fluid motor actuator. The speed control valve is operated manually to start the wipers and control the speed. The orifice in this valve limits wiper speed to 300 strokes per minute. Minimum operating pressure is 1100 psi.

operate 20" long drive arms and 20" blades, which at times are loaded up to 10 lbs. blade load on each blade.

F) Operable at temperatures ranging from –65°F to + 160°F.

G) Proof tested units up to 4500 psi pressure.

H) All seals, packings and fittings are "AN" standards.

I) Permits fast blade speeds without detrimental inertia effects because of the dash pots in the window unit pistons.

J) Intrinsic safety features—should the outlet port of the motor actuator be completely blocked, the actuator plungers keep cycling so that pressure cannot build up to cause possible bursting failure.

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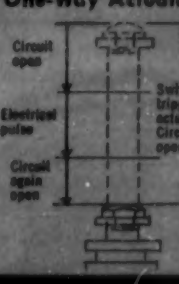

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Hydraulic Transmissions for Aircraft Accessory Drives

Enough power must be supplied by the hydraulic pump and motor combination to drive the accessory over the speed range of the engine.

By C. L. Sadler

IT is a well known fact, that accessory power requirements in aircraft have been steadily increasing since the early days of powered flight. It becomes a problem, therefore, to not only extract power from the engine efficiently, to drive the accessory, but also to deliver that power at constant speed under the widely varying and unrelated speed and power conditions of the main aircraft engine. The hydraulic transmission is actively being considered for the purpose.

Certain criteria can be established. For a hydraulic transmission, the three most important requirements center in the ability of the unit to transmit the power required for the driven accessory, to do so over the operating speed range of the prime mover, and to fit within the space limitations of the typical aircraft installation.

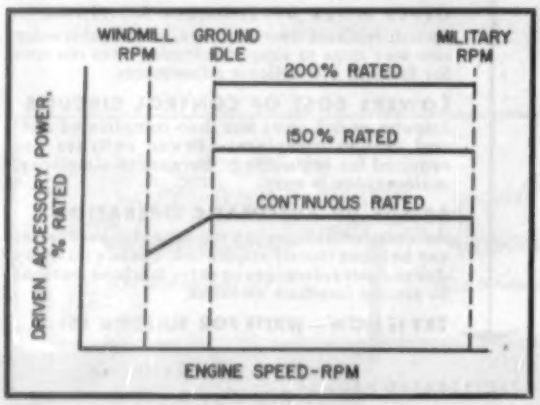

FIG. 1. Power requirements for an aircraft hydraulic transmission.

In the matter of power requirements, designers of electrical generators have for many years arranged their equipment such that the machine can deliver power appreciably in excess of the normal rating of the unit. Generators are, in fact, rated for continuous output, usually limited by thermal considerations and for overloads of 150 percent of normal rating for 5 minutes and 200 percent for 5 seconds. Since the generating equipment can produce these overloads, a necessary conclusion is that these 5 minute and 5 second ratings must be sustained by the transmission, and the unit must not be damaged by very short duration loads of 300 to 400 percent of normal rating. A load-speed schedule for the transmission is shown in Fig. 1. A desire has been expressed for part load capacity at engine speeds below idle in order to obtain constant frequency alternating current power with the engine windmilling. This would be the sloping line to the left of the idle point on the normal rated power curve.

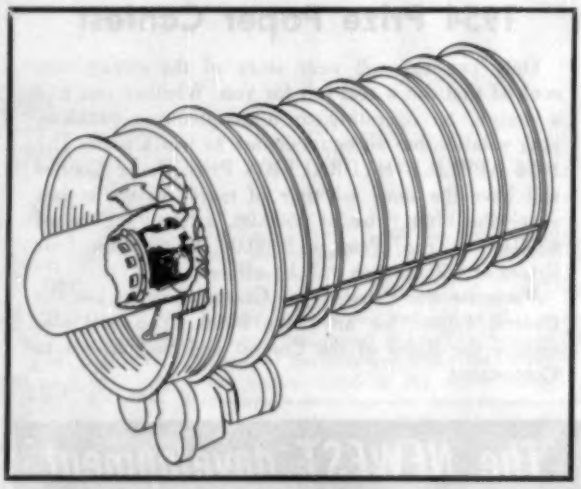

FIG. 2. A close coupled transmission mounted in the nose cone area of a turbo-jet plane.

Applied on Turbo-jets

Naturally, turbo-jet engines have presented the bulk of new requirements because of their widespread use in new military aircraft. Speed ratios of 2:1, ranging up to a maximum of 3:1 are common on this type of power plant. The absolute speeds at present, extend from 2000 rpm at idle, on one or more engines, to maximum speeds as high as 10,000 rpm on others. The main conclusion which so far can be drawn in designing transmissions for the pattern of engine requirements, is that standardization of types for cross-utilization on various engines might be a good idea

C. L. SADLER, Chief Engineer, Sundstrand Machine Tool Co., Hydraulic Division, Rockford, Ill.

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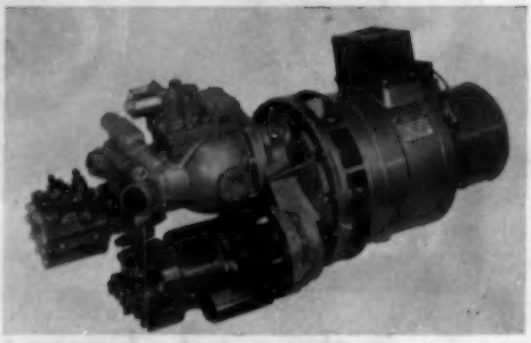


FIG. 3. Split system type transmission with pump and motor units in separate housings.

FIG. 4. Multiple pad gear box on motor unit of split system transmission, with alternator and airplane hydraulic pump installed.

but it is not known how to go about it without getting into more weight. In other words, specially tailored transmissions for specific applications will for sometime, be the rule rather than the exception.

The nose area, in aircraft, is generally an attractive location for a transmission. This space in most instances is not good for other accessories because of the problem of bringing a multiplicity of fluid or electrical lines out through the struts. A power drive in this location is also advantageous because it offers the opportunity of obtaining direct engine shaft power without the necessity of incorporating gearing. On turbo-prop engines, the nose cone space is not available.

Close Coupled and Split Systems

Fundamentally, a hydraulic transmission consists of a pumping unit to transform mechanical power to hydraulic energy and a motoring element to reconvert the hydraulic energy to shaft power. For want of better terminology, transmissions in which both elements are contained in one case are called "close coupled units", and those in which the motor and pump are separately encased, "split systems".

It is quite apparent that the close coupled unit will be the lighter design. In the nose cone area the best installation seems to be a unit bolted directly to the engine pad, with unit and driven accessory cantilevered from the flange without auxiliary support as shown in Fig. 2. On waist gear box installations, a wide range of configurations are possible. The most obvious would be the addition of a transmission between the engine pad and the accessory. As an optimum installation in the waist gear box, the transmission can be built either as an integral part of the box or as a removable cartridge.

Occasionally, situations will arise where space simply is not available in the vicinity of the engine for both transmission and drive accessory. In these in-

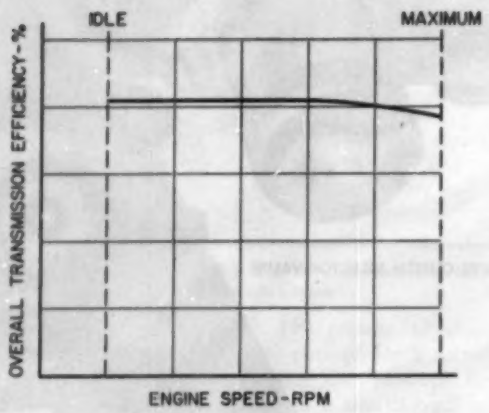
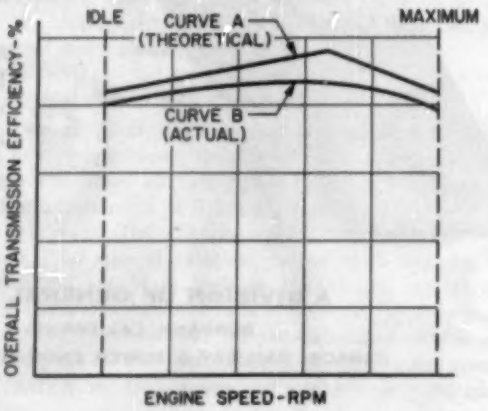


FIG. 5. Typical efficiency curve for split system transmission.

FIG. 6. Typical efficiency curve for close coupled differential transmission.



stances, the split system transmission can be useful, for it is necessary only to mount the pump element on the engine and the motor unit and driven accessory can be located elsewhere in the airframe. Typical elements of a 40 KVA alternator drive system are shown in Fig. 3. A unit in which both an alternator and a hydraulic pump are driven at constant speed by the hydraulic motor and gear-box, is shown in Fig. 4.

The operating efficiency of a hydraulic transmission is an important consideration in its evaluation. Achieving high transmission efficiency is not difficult, if the user is willing to accept the relatively large size and weight of a unit designed for low operating speeds.

Efficiency Determination

Churning losses of fluid in contact with parts rotating at high speeds can become very appreciable. Many of the fixed losses in a transmission remain constant, irrespective of size of unit, so higher horsepower transmissions may be expected to be more efficient than their smaller counterpart. A typical efficiency curve for a split system type transmission is shown in Fig. 5. It will be noted, that the efficiency remains quite constant over the speed range other than the small drop-off that occurs at high speeds due to churning and windage losses in rotating parts.

In the case of the close coupled units, not only are the losses attendant to connecting lines eliminated, but it is also feasible to use the differential transmission principle, in which a large portion of the power is transmitted mechanically. The result is a unit of fundamentally higher efficiency than the split system type. The theoretical efficiency curve for this type of mechanism is shown as Curve A on Fig. 6. The peak efficiency is reached at the time when there is no transfer of hydraulic energy. The actual efficiency curve for such a unit is more likely to appear as shown by Curve B on Fig. 6.

There is the question of dissipation of heat produced in a transmission. The most obvious system is to provide a separate reservoir for the transmission fluid, an air to oil cooler. A solution much more attractive to the airplane designer is to simply

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Aircraft Transmissions

tap into the engine oil system, making use of the already available storage and oil cooling capacity of the engine lube circuit. The use of engine fuel as a sink for transmission heat rejection, inherently obtained with the integrated engine oil system, has the immediate apparent advantage of eliminating drag associated with air-oil cooling. On some engines, the combined engine and transmission heat rejection can exceed the cooling capacity of the engine fuel supply, under certain low fuel flow conditions. In these instances, a supplementary air to oil cooler can be provided to remove the surplus heat.

Selection of Fluid

The evaluation of any aircraft component is not complete without considering the capabilities of the mechanism to function durably under the diverse and stringent environmental conditions encountered in modern aircraft. Fortunately, most of these seemingly onerous conditions have little or no effect upon the functioning of a hydraulic transmission. Of the items which could be troublesome, ambient and fluid temperatures are perhaps the most significant. The problem relates almost entirely to the fluid used and the resilient packings employed for sealing purposes.

It was quite natural that the first fluid employed for transmission use would be MIL-L-5606, the general purpose airplane hydraulic fluid. This fluid did not have either the shear stability or antifoam qualities necessary and as a result MIL-L-6387 was developed. Later came MIL-L-7808, similar to MIL-L-6387 and now this is expected to be used on all new installations.

One of the fundamental requirements in the design of a mechanism of this type, should be a freedom from any specialized machining or assembly problems which would adversely affect life or preclude expeditious overhaul of the units at an established military or commercial overhaul facility. This has been accomplished.

Prepared from a paper presented at the SAE National Aeronautic Meeting October, 1953.

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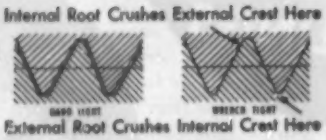

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Huge Hydraulic Pumps

Continued from page 47

the pumps required for the 18 inch tube reducer required about twice the gpm capacity and four times the hp capacity of the largest pump of this type ever constructed previously.

Pumps

To do the job, two axial piston, variable displacement, reversible angle plate type pumps were built. Each is capable of delivering up to 2300 gpm in either direction of flow at pressures up to 3000 psi.

Each pump has 13 cylinders using pistons of approximately 4 in diameter. System connections are 10 IPS for the main system and 3 inch for circulating and replenishing. A sliding type control on each pump

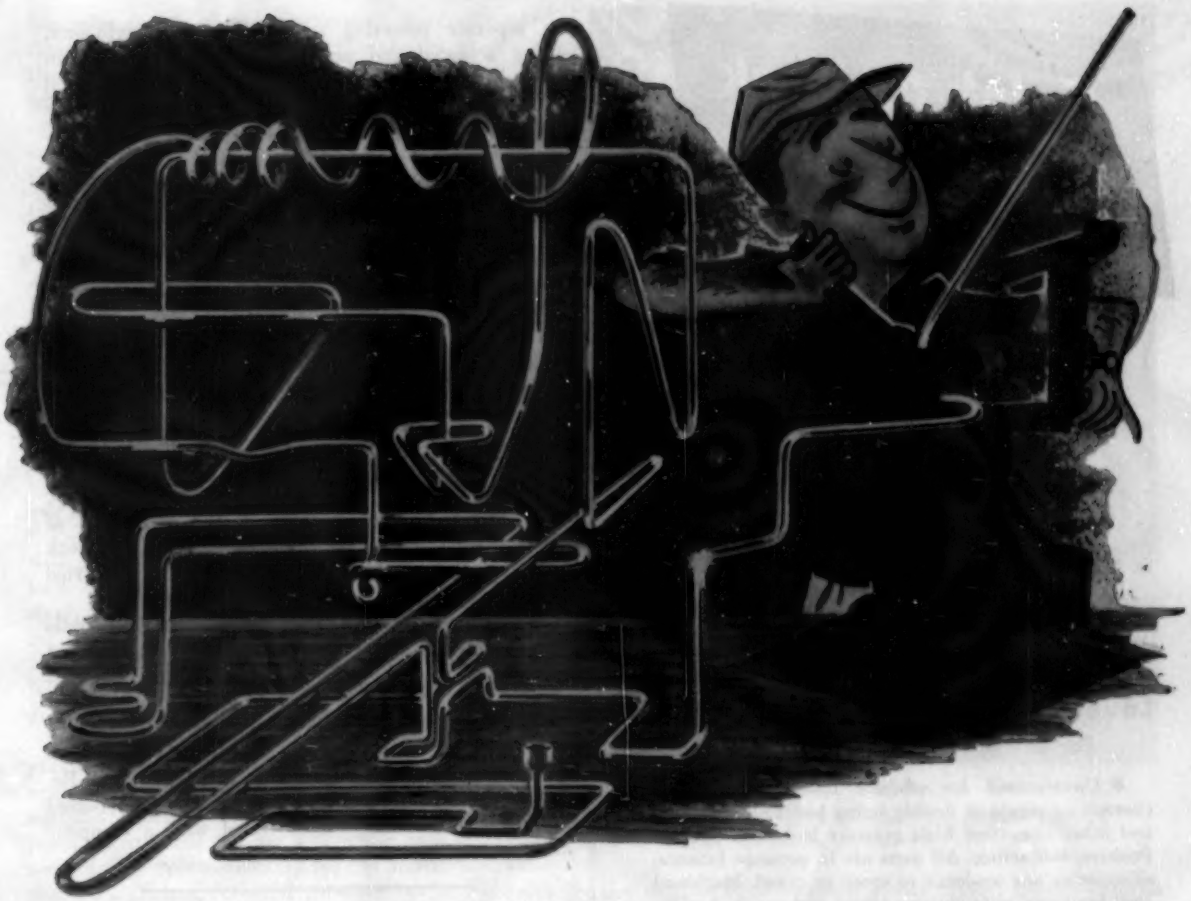
THE ROTATING group assembly—mainshaft, socket ring, cylinder barrel and piston sub-assemblies—of one of the 2300 gpm pumps.

determines the direction and rate of flow; the sliding control is actuated by an external hydraulic cylinder operated by the master cycle control. Stroke length and rate are adjustable while running; on this application the sliding control will provide any speed from zero to 45 cycles per minute.

Each pump is connected across a double acting cylinder with equalizing lines between the cylinders to insure simultaneous operation. The stroking of the saddle approaches a sine wave motion with the pump moving from zero to full stroke during the first half of the saddle movement in one direction and then moving from full stroke to zero in the second half, during which time the pump runs as a motor and acts as a brake. The pump angle plate crosses neutral just before the end of the saddle cylinder stroke. When the saddle is at the midpoint of its stroke, the pump angle plate gives maximum flow. At the end of the stroke, the pump angle plate gives minimum flow.

Adjustable displacement of the pumps permit speed control of the saddle in either direction without separate flow control valves. On this application the reversing feature of the pump eliminates the necessity

Continued on page 64



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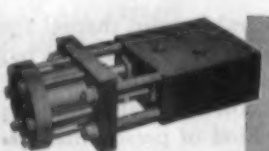

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for separate reversing valves. Centering cylinders, spring actuated and pressure released, are built in on each pump. These are arranged that in the event of electrical or pressure failure, they will immediately center the pumps, stopping the saddle. They also insure that the pumps are in neutral when starting. Overload protection is provided by full flow, adjustable, by-pass relief valves. These are also integral with the pump.

A servomechanism controls the pump angle plates during stroking using the phase shift between the saddle and the pumps to provide the control force.

The pumps are driven electrically through speed reducers with a ratio of approximately 4.83 to 1. The high speed shaft of each speed reducer carries flywheels which work with the saddle so that stored energy of the system flows from the flywheel to the saddle and back. This conservation of energy makes it possible to drive each pump with a 700 hp 1800 rpm electric motor. Each pump requires a peak power input of more than 3500 hp. The difference between this peak and the output of the 700 hp electric motor is carried by the flywheel.

The pumps are required to accelerate the saddle from a standstill to 600 fpm in ½ second and in three feet of travel during which the units act as pumps and the flywheel energy is passed along to the saddle. During the next half second and three feet of travel, the pumps act as motors, decelerate the saddle from 600 fpm to zero and store energy in the flywheel. Reversal occurs instantaneously and the cycle is repeated in the opposite direction of travel with a complete cycle occurring every two seconds.

Simplified Valving

Concluded from page 39

mon to normally closed solenoid operated air valves. The air pressure going to each air valve is governed by a pressure regulator mounted in the control panel, each regulator having a calibrated air gauge. Each air valve, therefore has a preset air pressure which will give a particular relief valve setting by merely energizing the air valve solenoid—thus opening the valve and allowing this preset air pressure to enter the bellows of the main relief valve. When the air valve is closed by deenergizing the solenoid, the air pressure in the bellows is automatically bled off through an orifice in the air valve manifold. This design makes available various pressure relief settings during one cycle of the press while using only one relief valve.

A small limit switch, actuated by an arm fastened to the vent valve stem, is the main pressure switch. Movement of the vent valve indicates that the pressure setting of the relief valve has been reached. Protection against overload is provided by this valving. The pressure switch signals the main valve to shift and reverse press travel.

Blankholder Diverter Valve

A blankholder diverting valve is included on the valve panel used on a double acting press. The divert-

ing valve directs oil to both the main 4-way valve and the blankholder valve or to the blankholder valve only through port "C". This unit is mounted to the bottom of the 4-way valve unit and to the subplate. A solenoid operated spring off-set two position 4-way pilot valve controls the motion of the spool. With the solenoid deenergized, pilot pressure holds the spool to the right, directing pump discharge to port "C" and also to the 4-way valve. With the solenoid energized, the spool is shifted to the left, blocking the port to the 4-way valve and diverting the main pump output to the blankholder holding valve unit through Port "C".

Holding Valve

The holding valve unit has a two-fold purpose. First, it serves as an adjustment for the gravity closing speed of the slide. Second, it acts as an adjustable check valve to prevent the slide from drifting down due to any leakage of oil past the main 4-way valve spool.

Port "B" shown on the holding valve is connected with port "B" on the 4-way valve. Port "C" is the pullback cylinder connection. The unit consists of three small spring loaded valves as designated on the drawing.

Valve "R" merely acts as a check valve permitting flow of oil to occur only from port "B" to port "C" during the return stroke of the slide.

Valve "S" is adjustable and is used to control the gravity drop speed of the slide. When the solenoid operated 2-way valve is energized, port "F" is connected to port "G". This vents the top of the valve piston to the tank causing a pressure drop across the small drilled hole connecting the top and bottom valve chambers. This differential pressure opens the valve against the adjustable stop. The oil from the pullbacks is now allowed to flow through the open valve "S" and through port "B" to the 4-way valve which is now shifted connecting port "B" to the tank. The degree to which valve "S" opens determines the speed with which oil can escape from the pullback cylinders, thereby, governing the slide speed during fast advance. Deenergizing the solenoid blocks port "F". The pressure on both sides of the piston equalizes, and the spring plus the pressure on the larger top side area closes the valve.

Valve "T" is a spring loaded adjustable valve used to adjust the pullback cylinder pressure necessary to keep the slide from drifting and to prevent surges of high pressure when valve "S" closes after the fast ram advance.

Multi-Action Presses

The basic hydraulic control unit shown in Figure 2 is applied to single acting presses and to the main slide of double and triple acting presses. The additional circuits required for the blankholder and third slide are interlocked with this basic circuit and are of equal simplicity. Figure 5, the schematic of a double acting press shows the use of a blankholder valve which includes 4 air balanced relief valves to permit independent control of pressure at each corner. Simplicity of piping has been realized by the use of integrated valve designs.

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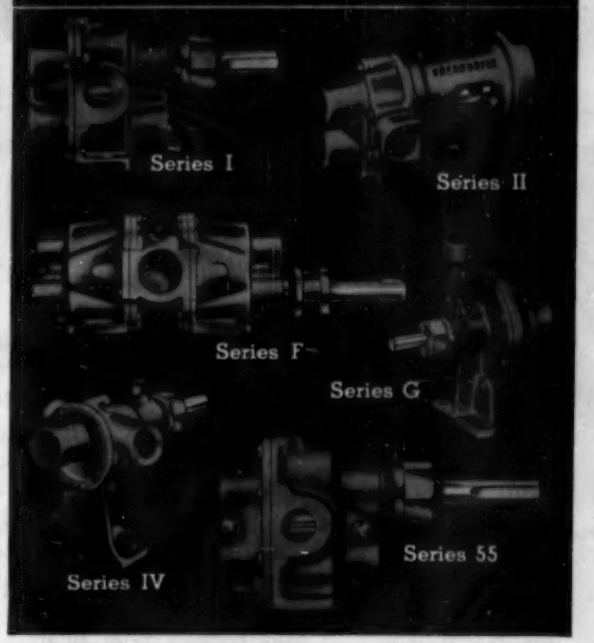

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"O" RING HANDBOOK . . . has been announced as available by Plastic and Rubber Products Company. It contains charts, illustrations, graphs and all engineering data in the development of the "O" Ring seal. Included is design information on internal and external grooves, gland finishes, chamfers selection of gland, piston rod and cylinder materials and lubrication. Individual design problems may be analyzed by completing data sheets included with the handbook and mailing to the company's technical department. The handbook #504 features a quick reference guide.

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AIR AND HYDRAULIC CYLINDERS . . . for heavy duty industrial and steel plant applications are described in a 25 page booklet, released by The Lincoln Machine Co. The construction and mounting styles of oil hydraulic cylinders, heavy duty mill type air cylinders and standard duty air cylinders are included. A great deal more data on other cylinders is given, together with mounting views and engineering data charts. A typical cross sectional view is shown and also the principal features of the cylinders. A section is devoted to rotating hydraulic cylinders, hydraulic power units and special purpose cylinders.

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TUBE BENDING MACHINES . . . for every bending operation, are featured in a bulletin released by Chamberlain Industries, Ltd. Features and specifications of the 3 in. capacity open type bending machine and of the 4 in. capacity hydraulic tube bending machines, are given. The motorized model has sufficient power to manipulate 4 in. tubes. In addition to steam and gas tubes, electrical conduit and flat bars may be bent up to 90 degrees. All of this is presented with interesting and practical data, useful to anyone with bending problems. Photographs show the various models available.

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MINIATURE HYDRAULIC VALVE . . . two way or three way, for the automatic control of hydraulic systems, at pressures up to 1000 psi, are described in a data sheet #529 prepared by Skinner Electric Valve Div., The Skinner Chuck Co. Specifications and a flow chart add to the usefulness of the bulletin. The valve is a spring loaded direct-acting slide-type. There are stainless steel internal parts. Various types are listed.

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INSTRUMENTATION . . . A 128 page, spiral bound Catalog No. 453, has been released by The Foxboro Company. The contents consist of the following material: standard bulbs, pressure instrumentation, flow meters, pneumatic rorameter, liquid level and position and motion instrumentation. The above groupings may be classified under measurement systems. Under a broad grouping of instruments, the following may be cataloged: dial type indicators, time-schedule controllers and consotrol instruments. Many other subjects are presented in a most complete study. A visual index aids in quickly locating subject material.

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REVOLVING JOINTS . . . Barco Manufacturing Company has issued Catalog No. 300-A (rev) which covers the company's complete line of swivel joints, ball joints, revolving joints and swing joints. Sections are set up for the three styles, single flow, syphon and revolving syphon, each of which carry steam, oil, air, water and gas. Complete set of dimensions are given for each size joint. Also included is a cut-a-way view.

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WIRING CONDUIT AND METAL HOSE . . . A 16 page Catalog CC-400 issued by American Metal Hose Branch, of The American Brass Company, describes flexible metal hose and tubing. It is complete with many illustrations of the types available and tables of the general specifications. Many of the features are described and sectional views presented. Bulletin No. UA-530 describes the company's line of flexible, liquid-tight, electrical wiring conduit. A specification table is given showing sizes available. Another bulletin EF-535 covers their extra flexible, liquid-tight conduit for electrical wiring. The wiring conduit for maximum protection in wet spots is shown in many applications and other uses are suggested. A specification chart gives the dimensions of the sizes of conduit which are available.

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NON-FLAMMABLE SAFETY PACKAGE . . . which consists of a group of processing products that are safe to use in the vicinity of fire and intense heat, is described in an 8 page folder available from E. F. Houghton & Co. One of the products presented is their non-flammable hydraulic fluid. It will not burn or explode. They produce a rust preventative, safe water solution which cleans at room temperature and an all purpose water-soluble cutting base. The folder has been released in the interest of plant safety. The products are in the standard line.

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MAGNET SEPARATOR . . . for the extraction of iron and steel particles and chips from circulatory, lubricating and hydraulic oils is featured in a six page bulletin released by S. G. Frantz Co., Inc. A complete description of what the filter is designed to do, its applications, how it operates and its use in lubrication, coolant and hydraulic systems is presented completely. The filter removes particles from the oil, magnetically. Various installation sizes are tabulated and interesting installations are shown in photographs. Miscellaneous applications show the many uses to which the filter may be put. Also included is a section on how and when the filters may be cleaned.

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CHEVRON PACKING . . . is featured in a six page folder, Form No. AD-115, offered by The Garlock Packing Company. A description is given showing that as the pressures increase, the packing automatically tightens to prevent leakage. And as the pressures lessen, the rings ease off and permit free operation of the rod or plunger without leakage. A reduction of the depth of the stuffing boxes is possible due to the packing ring design. The rings are furnished in ring form only. These are some of the features outlined. Types supplied include hydraulic, cold oils, hot oils and separator rings. All of this is combined to cover the subject very thoroughly.

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MECHANICAL SEAL . . . Byron Jackson Co. has prepared a Bulletin No. 153-10000, which does a very complete job in describing the operation of present day mechanical seals. They are classified as unbalanced where stuffing box pressure acts directly against the seal face, or balanced where stuffing box pressure acts only on part of the seal face. Many line drawings are used to illustrate the pressures involved under various circumstances and to tell exactly how unbalanced seals function.

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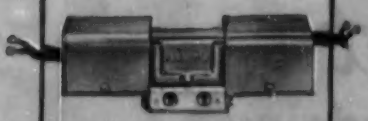
CC1-25, Solenoid-Operated Spring Return

CC6-25, Foot Operated



CC11-25, Solenoid-Operated Momentary Contact Type

CC7-25, Foot-Operated Locking

CC2-25, Ball Cam-Operated

CC10-25, Piston-Operated Spring Return

CC4-25, Hand-Operated
CC5-25, (Same), Locking

CC12-25, Piston-Operated Momentary Contact Type

Now!

¼" P-M 4-Way Valves!

more compact, less expensive than any similar valves

Here's a new series of direct-operated 4-Way Valves for the control of small, double-acting air cylinders. It's the latest addition to Hannifin's revolutionary "P-M" line.

Designed for easier maintenance. The only moving part is the valve stem with its two poppets. The valve body, which contains this stem, is quickly removed from the separate "manifold" to which all pipe connections are made. Thus, the entire valve can be serviced without breaking line connections.

The CC Series. These new "P-M" 4-Way Valves, nominally of ¼" pipe size, flow so much air that they can be used competitively with other ⅜" valves when ordered with ⅜" ports. They are corrosion resistant throughout and meet J.I.C. recommendations.

Compare! You'll find these new Hannifin 4-Way Valves more compact, simpler and easier to use, and *less expensive* than any comparable valves.

GET THE COMPLETE HANNIFIN "P-M" AIR CONTROL VALVE CATALOG

The new Hannifin Controls Catalog contains complete information and specifications on all Hannifin "P-M" Valves, including this new 4-Way direct-operated series. Write for Bulletin 232.

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Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

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HILCO

Oil contamination is one of the largest single causes of hydraulic equipment failure. Eliminate dirty oil with HILCO Purification . . . keep your oil clean by removing products of oxidation, acids, sludge and moisture. Increase the life of your oil and cut costly downtime with HILCO Purification.

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Circle 41 on Reader Service Card

USEFUL LITERATURE

FLUID MOTORS . . . Application data sheets on a new series of fluid motors are now available as announced by the Hydreco Division, of The New York Air Brake Company. The new line of fluid motors is available in capacities up to 52 hp, 1500 psi. All the motors are gear type and are of reversible rotation. The literature also contains dimensional drawings and performance curves which enables anyone to determine the type of motor needed to meet individual requirements. Data sheets will be mailed along with the general bulletin of the company's products. Write for Bulletin 101B and 137.

Circle 187 on Reader Service Card

SILICONE PRODUCTS . . . A 1953-54 reference guide for silicone products has been released by Dow Corning Corp. The design engineer has a certain application in mind when he studies a catalog rather than the product. For this reason the cross-reference application index is very useful. Some of the main product divisions are silicone fluids, silicone adhesives, silicone release agents, silicone greases, silicone water repellents, silicone bonding resins and silicone defoamers. Under headings such as these, are listed a complete line of silicone products. Many special bulletins may be obtained concerning these various products. Bulletin numbers are given so that additional information can be obtained if desired.

Circle 188 on Reader Service Card

LEAKPROOF CHECK VALVE . . . sealing efficiently at both high and low pressures is described in a folder, S-2021, offered by James-Pond-Clark. Several features, some of which are positive leak-proof seal, resistance to chatter and flutter, a tight seal at all pressures, and minimum restriction to flow are discussed. The various sizes of internal pipe thread connections ranging from ⅛ in to 1 in and SAE tube connections from ¼ to ¾ in, are listed. Technical characteristics such as working pressures, fluids and operating characteristics are presented. Cross sectional views show the construction of the valve.

Circle 189 on Reader Service Card

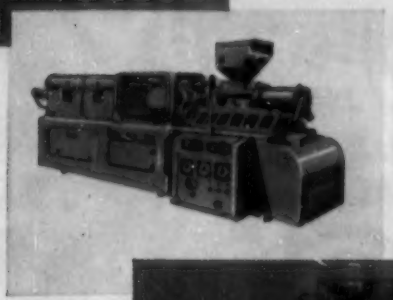
PACKINGS AND GASKETS . . . fabricated from the new tetrafluorethylene resin, Teflon, are presented in a 12 page booklet, bulletin No. T-103-1, released by Crane Packing Co., Ltd. The outstanding properties of Teflon and various uses of Teflon products are included. Advantages and applications of "C-V" rings, a universal packing, ideal for valve stems, is given. All of the standard sizes of the "C-V" rings are listed showing the stem and box bore sizes of the stuffing box

'VSG'

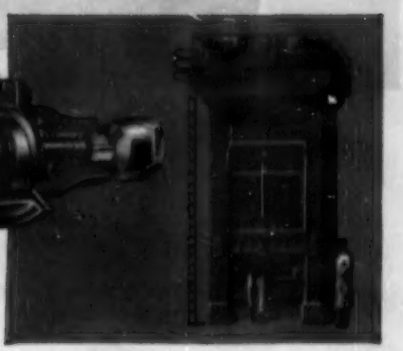
Regd Trade Mark

Infinitely VARIABLE DELIVERY PUMPS

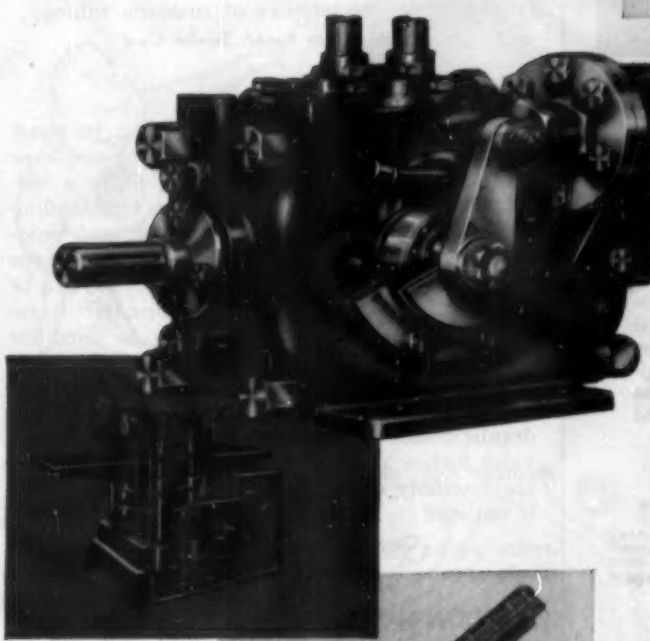
Mobile Manipulator



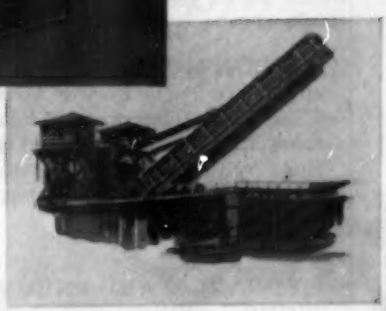
Injection Moulding Machine



Hydraulic Press



Matrix Press



Rolling Lift Bridge

'VSG' Pumps are axial piston pumps of high volumetric efficiency, giving infinitely variable delivery from zero to maximum pump capacity.

They are made in seven sizes, delivering from 5 to 360 gallons/min. in three pressure ranges, 1000, 2000, 3000 p.s.i.

With the auto pump, as illustrated, delivery is automatically regulated by the pressure in the hydraulic system. The manually controlled variable delivery pump gives constant delivery for any given setting irrespective of pressure variations.

Full details on request from

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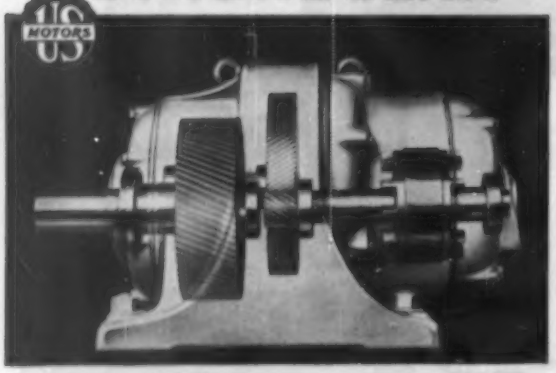
Geared Power
SIMPLIFIED WITH
SYNCROGEAR



The motor that internally gears its speed

DON'T go to the expense of installing a gear box with extra coupling and guards to rig up slow speed for a motor. Install the *U.S. Syncrogear motor* and avoid extra contraptions. You'll simplify your power hook-up, save space, eliminate hazards and give your driven machine the most efficient power. The U.S. Syncrogear motor was one of the first complete integral power units, introduced 22 years ago. It's backed by experience, tested and proved performance and engineering "know-how" that only U.S. MOTORS can offer to those seeking the most dependable geared motor power.

SYNCROGEAR ADVANTAGES

- Compact—rugged—quiet
- No external gear box
- No extra coupling
- Internally-geared
- Single unit on one base
- Completely housed
- Reduced frictional losses
- Permanently-aligned parts
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- Pyramidal supporting base
- Solid shank pinion
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- In-a-line shaft
- Neat, streamline appearance
- Drip-proof surface

U.S. SYNCROGEAR MOTOR 4 TO 10,000 RPM. 1/4 TO 30 H.P.

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Useful Literature

and the ring stock height. Braided packings and gaskets are listed showing construction and styles. Molded packings, extruded rod and tubing, molded forms and tape, and bellow connectors are other products presented.

Circle 190 on Reader Service Card

TITANIUM TUBING . . . Properties, applications and advantages of titanium tubing are presented very completely in Bulletin No. 42 offered by Superior Tube Company. Some of the research and development which went into the product is outlined, together with the properties of titanium which make it a promising material for many new applications. Tube sizes of seamless titanium and weldrawn titanium are listed. Tubing tolerances, chemical analysis and finishes are other topics discussed. A very interesting and informative section is written on processing and fabricating characteristics of titanium tubing.

Circle 191 on Reader Service Card

AIR AND HYDRAULIC VALVES . . . for hand, foot, cam and remote pilot control of single or double acting cylinders are described in a bulletin released by Ortho Pneumatic. Outstanding features are a balanced spool design and unrestricted flow. Standard aircraft-type neoprene "O" rings are used. The valve does not have to be removed from the installation or pipe line, to replace the gaskets. The valve may be used for compressed air, vacuum or oil service. In a hydraulic circuit, the valve may be air-piloted; or as an air valve may be interlocked with a hydraulic circuit for safety or sequencing. Two basic valve bodies and ten attachments allow immediate assembly of 100 different valves. All of this is outlined in the bulletin.

Circle 192 on Reader Service Card

TEFLON MOLDED "O" RINGS . . . have been announced by the Plastics Division, of The Sparta Heat Treat Company. A data sheet is available describing the quality and uniformity of "O" rings by the molding process.

Circle 193 on Reader Service Card

HYDRAULIC AND PNEUMATIC APPLICATIONS . . . Fifteen applications of hydraulic and pneumatic systems, representative of the engineering and manufacturing services available from The Rucker Company, are pictured and described in a new 4 page brochure. Industries covered by these applications range from agricultural, canning, lumbering through automotive, aviation and marine to construction, chemical and metal working. The brochure is identified

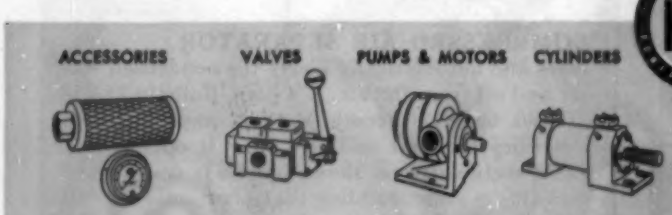
POWER UNITS

for every need

***UNDIVIDED RESPONSIBILITY** of H-P-M for the operation of the hydraulic system is an important advantage to user . . . another reason why you should specify H-P-M!*

- Completely self-contained "packages" of hydraulic power conforming to J. I. C. standards.
- Reservoir capacities 10 to 225 gallons.
- H-P-M Power Units include all necessary pumps, valves, oil filters, strainers, air cleaners, oil level gauges, piping and heat exchangers where required.
- Compact, modern design with all parts readily accessible for easy maintenance.
- Many combinations of H-P-M variable and fixed displacement pumps offer variety of volume and pressure ranges for every requirement.
- H-P-M Power Units pre-tested and ready for immediate operation.

. . . Write for H-P-M's new fact-filled catalog on Pumps, Motors and Power Units . . . ask for Cat. No. 601 TODAY!



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STEEL HYDRAULIC COUPLINGS

"THE MOST COMPLETE FITTING LINE"

JIC FLARED TUBE
DRYSEAL PIPE FITTINGS
RESTRICTORS
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BARBED HOSE STEMS
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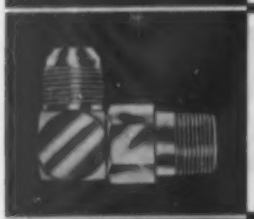
NEEDLE VALVES
- 5000 PSI
- Compact, bar stock body
- Use for shut-off or metering
- Tube or pipe outlets
- Line or angle

BALL CHECK VALVES
- Compact, bar stock body
- Tube or pipe outlets
- Fixed or adjustable spring loading



SWIVEL ELBOWS
- 1200 PSI
- Tube or pipe outlets
- Rotates 360°

PIPE NIPPLES
- Clean bore, seamless steel tubing
- Dryseal NPTF threads
- Cadmium plated

Representatives in principal cities
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Circle 47 on Reader Service Card

USEFUL LITERATURE

as 753-5M. The booklet is well illustrated and complete description as to capacities and pressures is given.

Circle 194 on Reader Service Card

STEEL PIPE AND TUBING . . . Engineers who are working on the design of equipment operating at elevated temperatures or pressures will be interested in a new 6 page data folder TDC 163, prepared by the Tubular Products Division of The Babcock & Wilcox Company. The folder presents condensed technical data on 14 tubing steels used in high temperature or high pressure service. Data on analyses, mechanical and physical properties, creep strength, short time elevated temperature, tensile properties, oxidation resistance and other pertinent information, is presented.

Circle 195 on Reader Service Card

AIR CONTROL MANIFOLD . . . which eliminates leaks and piping is presented in Bulletin No. 953 offered by The Republic Manufacturing Company. Although the unit is specifically designed for presses, the arrangement of controls makes it a useful aid in controlling and regulating air service in many types of circuits, including automation auxiliaries. Such actions as clutch and service brakes, counterbalance cylinder, die cushions and lifters, kickers, unloading devices, spray compound and gage stop, can now be brought close to the operator's working position. With the use of headers, manifolds may be connected together.

Circle 196 on Reader Service Card

VALVES AND CYLINDERS . . . are described in an 8 page Bulletin No. SW-2 prepared by the Nopak Division of Galland-Henning. A complete presentation is given of low pressure air and hydraulic cylinders with pressures up to 650 psi and high pressure hydraulic cylinders with pressures up to 1500 psi. Other sections of the bulletin cover hand operated air and hydraulic valves, pneumatic-hydraulic foot-operated 2-, 3- and 4-way valves. Solenoid operated valves and 3- and 4-way pilot pressure and bleeder operated air control valves.

Circle 197 on Reader Service Card

COMPRESSED AIR SEPARATOR . . . separates and automatically ejects the condensed water and oil from the air. A 4 page Bulletin DA is offered by New Jersey Meter Company which describes the unit and just how it operates. A cross sectional view shows how it is constructed and aids in understanding the operation. Features of the unit, it is explained, are automatic draining, and ease of installation, as it is piped straight through requiring minimum pipe fittings. In-

RACINE *Variable Volume*

OIL HYDRAULIC PUMPS

"The heart of any Hydraulic Circuit"

MODEL P
Variable Volume Pump
12-30 G.P.M.
Pressures to 1000 p.s.i.

MODEL J
Variable Volume Pump
20 G.P.M.
Pressures to 1000 p.s.i.

MODEL P
Variable Volume Pump
5 G.P.M.
Pressures to 1000 p.s.i.

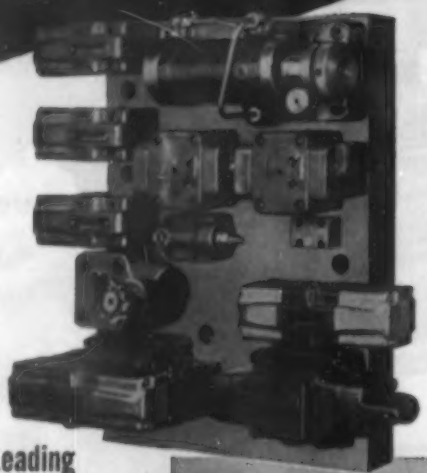
USE RACINE PUMPS, VALVES, PRESSURE BOOSTERS AND RESERVOIR UNITS

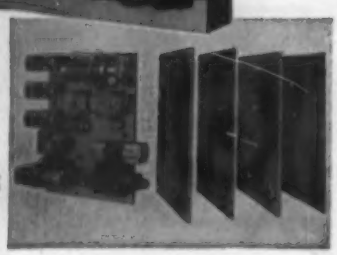
"They Work Better Together"

SALES AND SERVICE REPRESENTATIVES IN ALL PRINCIPAL CITIES

Racine Variable Volume Pumps simplify the circuit. They reduce heat losses and save horsepower. Relief and by-pass valves with extra piping are unnecessary. Your initial circuit costs are usually lower. Write for complete catalog and name of your nearest Racine Field Office. Complete engineering service available . . . Address: RACINE HYDRAULICS & MACHINERY, INC., 2074 Albert Street, Racine, Wisconsin, U. S. A.

ENGINEER *Simplicity* INTO YOUR HYDRAULIC EQUIPMENT CONTROL SYSTEMS





Leading Hydraulic Manufacturers Are Using Almo Manifolds to Cut Costs and Obtain Permanent Trouble-Free Operation

Almo has perfected the manifold method of channelling hydraulic fluids at high pressures after years of research and can apply it to your equipment. Send a diagram of one of your present hydraulic circuits. Without obligation we will return an Almo Manifold diagram demonstrating how the job can be completely simplified.

This maze of piping and tubing, all subject to failure resulting from vibration and deterioration, can be eliminated and made as compact and simple as the unit illustrated above.

Write for our new brochure

ALMO TOOL CO.

11470 KALTZ AVE. • CENTERLINE, MICH.

USEFUL LITERATURE

formation is also given on their air meters which measure the air consumption of any pneumatic tool, rock drill, air meter, sand blast, air lift or any other pneumatic device or process.

Circle 198 on Reader Service Card

FLUID CONTROLS . . . are described in a new 66 page catalog (No. 2) recently released by Hoke, Inc. Some of the products which are presented include high and low pressure cylinders, several flo-gages, needle valves, packless valves, pressure gages, pressure regulators, toggle valves and in addition engineering data such as flow curves, for air and water, and also dimensional data. The catalog is very complete and each section considers applications, quick selection charts and adequate description of the various types. All parts listed are standard; however, requirements for special needs are welcomed. Many photographic illustrations aid in visualizing the products being described.

Circle 199 on Reader Service Card

GUIDE RING . . . The Auto-Diesel Piston Ring Co. has released a bulletin on their new guide ring. This ring is to be used in single acting hydraulic cylinders. They are made out of bronze in sizes 2 in up to and including 10 in diameter. The various standard ring styles such as compression, oil wiper, motor seal etc., are described and illustrated. A stock list shows the widths available for each diameter. The wall thickness is also listed for each diameter.

Circle 200 on Reader Service Card

GEAR MOTORS . . . An attractive 14 page booklet GEA-6027, has been released by General Electric Company. Output shaft speeds range from 780 to 5.7 rpm and ratings from 1 to 30 hp. Illustrated in color, the different types are shown in cut-away with the features of the motor labeled. Some of the units shown are the single reduction offset-shaft, compound reduction, double reduction, and worm type gearing. Features and construction are outlined together with the electrical types and characteristics. A selection chart to aid in determining the proper motor for the job is also included.

Circle 201 on Reader Service Card

HOSE COUPLINGS . . . in various materials are described in bulletins issued by Scovill Manufacturing Company. High copper alloy ferrule and brass body are materials used in the high pressure hose coupling. Each part of a hose coupling, the ferrule and the body has a specific function. The ferrule must hold the hose firmly to the shank and yet be ductile enough to take a reduction on to the hose. The body must withstand

extremely high compression stresses and at the same time be machineable for production. It is explained that such a construction simplifies the attaching methods. Another bulletin covers the compression brass tube fittings. A complete list of tube sizes, pipe threads, and part numbers is given for male and female connections, union and 90 degree union elbows, 90 degree male and female elbows, tees and several other types. Similar information is given in a bulletin on compression, and anodized aluminum tube fittings.

Circle 202 on Reader Service Card

CASTING REPAIR PLUGS . . . The purpose of which is to provide an economical method for repairing and salvaging castings that might otherwise be scrapped, is described in bulletins offered by U. S. Plug & Fitting Co. They are available in square head solid, square head long, and square knock off head. Brass, aluminum and malleable pipe plugs are listed as per size. Many other products are cataloged, some of which are magnetic pipe plugs and drain plugs, stainless steel pipe plugs, reducer bushings and cast iron pipe plugs.

Circle 203 on Reader Service Card

CASE HISTORIES . . . tell how Honan-Crane filtration equipment has solved coolant clarification problems at two large metal-working plants. These bulletins prepared by Honan-Crane Corp. are printed in color and contain actual plant photos, as well as schematic drawings of coolant systems in operation.

Circle 204 on Reader Service Card

FLEXIBLE METAL HOSE . . . of all types is covered very completely in a 32 page illustrated catalog, released by Flexonics Corp. Chicago Metal Hose Div. The catalog covers the full range of the company's product in corrugated metal hose, convoluted hose types, stainless steel flexible metal hose and other special purpose assemblies. Featured is the new industrial heavy duty stainless steel hose. More in detail, the hoses cataloged are hydraulic, pneumatic, steam, chemical, lubrication, coolant, insulated, exhaust, gas and hot air hose, vacuum and a variety of other products such as platen press connections, ducting, metal conduits and vibration eliminators. Complete specifications are included and also helpful installation information.

Circle 205 on Reader Service Card

FILTERLESS PURIFIERS . . . A new condensed bulletin No. 201, fully describes this line type purifier and its uses. The bulletin, issued by The V. D. Anderson Company, discusses the removal of condensate from compressed air lines, dirt particles and line scale from steam and entrainment and carryover from vapor lines. The

Proved in Service...

NOPAK

SERIES 1500

High Pressure Hydraulic Cylinders

The successful design, construction and application of high-pressure hydraulic cylinders, under a wide variety of working conditions, is the result of specialized knowledge based on years of experience in the field of high pressure hydraulics, carefully selected materials, special skills and fine workmanship. Reports from users indicate that NOPAK Series 1500 Hydraulic Cylinders have established new standards of design, precision, construction and performance in the high pressure field. They have been "Proved in Service".

NOPAK Series 1500 High Pressure Hydraulic Cylinders are available in 5 Standard Mountings, in diameters from 1½" to 8", in Adjustable Cushion or Non-Cushion Types.

GALLAND-HENNING NOPAK DIVISION • 2743 S. 31st St. • Milwaukee 46, Wisconsin

Refer to Sweet's File for Product Designers or write for Bulletins HC-1 and SW-1.

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Representatives in Principal Cities

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NOPAK

VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

NEED HYDRAULIC PUMPS IN A HURRY?

Now... **you can get hydraulic pumps**

WHEN YOU NEED THEM!

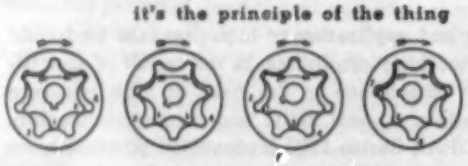
Gerotor can deliver from stock . . . immediately . . . any of their standard hydraulic pumps, covering ranges as shown in the table. If you have pump requirements and need immediate service . . . call, wire or write Gerotor today.

Type Pump	G.P.M. Range	P.S.I. Range	R.P.M.
"B"	4–1.5	0–1000	1800
"QDH"	3–12	0–1200	1200
"O"	20–40	0–1000	1200

Whatever your need in hydraulic pumps or motors consult the Gerotor May engineers. *Write for free literature.*

GEROTOR MAY CORP. • **BOX 84, BALTIMORE 3, MD.**

Gerotor is not just a name . . .
it's the principle of the thing



The two Gerotors revolve at different speeds, resulting in a continuous opening and closing of spaces as shown in this diagram. Follow the changing position of tooth #1 as rotation takes place. Note its relation to space #2. As rotation continues, tooth #1 gradually displaces oil from space #2, thus creating pressure.

GEROTOR
HYDRAULIC PUMPS & MOTORS

USEFUL LITERATURE

selection of purifiers has been simplified by charts which enables anyone to quickly select the size purifier which will give the best efficiency at various flows and pressures. Other features include installation diagrams, tables of dimensions and weights. A general description of the operation points out that a combination controlled baffle and centrifugal force design removes more than 99 percent of entrainment from gases and vapors. No filters are used.

Circle 206 on Reader Service Card

TUBING . . . for all types of hydraulic, pressure, mechanical, diesel and specialty applications is presented in a new booklet offered by the Columbia Steel & Shafting Company. The booklet is complete with typical sizes, working pressures, specifications and other engineering data on all types of cold drawn seamless tubing, produced by the company. It is explained that Summerill hydraulic tubing flares uniformly without cracking to provide tight, leak proof joints. It will withstand sharp 90 degree bends without flattening.

Circle 207 on Reader Service Card

HIGH SPEED PUMPS . . . A new 12 page Bulletin 10051-C illustrating and describing a complete line of fluid power pumps, motors, transmissions, cylinders and valves has been released by The Oilgear Company. Featured, is an expanded line of variable and constant delivery pumps for operation at higher speeds, a new line of small (1 hp) variable delivery pumps, a new line of constant delivery duplex pumps for pressures up to 5000 psi; and a larger capacity feed pump. This eq uipment is used in the iron steel, metal working, plastic, automotive, printing and lumber industries. Each pump type is complete with illustrations and specifications. In addition to pumps, standard cylinders for pressures of 1500 psi and heavy duty cylinders for pressures of 3000 psi are included. Cross section views of the cylinders show the construction and add much to the value of the bulletin.

Circle 208 on Reader Service Card

HYDRA-SPRING . . . utilizes the compressibility of various fluids to provide a resiliant action such as provided by a conventional spring. An instruction manual has been released by Wales-Strippit Corp. describing the operation of the unit. The resistance of the hydra-spring can be varied by changing fluid volumes, fluids, or fluid operating temperatures within the design limits of the metal cylinder and non metallic seal. Large load variations can be obtained by adding or subtracting fluid. A graph is included which shows the characteristics possible using various fluids and preloads. Complete instructions with photographs are given on how this unit is serviced.

Circle 209 on Reader Service Card

Circle 34 on Reader Service Card

Circle 49 on Reader Service Card →

CYLINDERS!

CYLINDERS.. heavy duty Air or Hydraulic

CYLINDERS!

More of them..and faster!

Why? Because we're in our new factory . . devoted exclusively to the manufacture of Lindberg air and hydraulic cylinders . . standard, special, and mill type.

Our capacity has been quadrupled . . our service streamlined. *Rush deliveries when necessary.*

Design engineers for original production equipment manufacturers, have specified Lindberg Cylinders on applications such as lathes, drill presses, industrial furnaces, straightening presses, plastic extrusion presses, die casting machines, marking machines, and shears, as well as a wide variety of construction machinery.

Ask for Bulletin 1600 covering the complete line of standard and special Lindberg Cylinders . . air and hydraulic.

LINDBERG AIR..HYDRAULIC CYLINDERS

Lindberg Air and Hydraulic Division

Lindberg Engineering Company, 225 North Laflin Street, Chicago 7, Illinois

NEW PRODUCTS

Components, tools and equipment designed to improve operation of fluid pwer systems are described here . . . for more information fill in and mail the pos: card bound in this issue.

PILOT OPERATED CHECK VALVES
. . . for high or low pressure

Sizes: From 2 to 8 in., in pressures to 3500 psi. Pilot operating pressures from 100-3500 psi.
Design: Free flow in one direc-

tion; flow in reverse direction is blocked until pilot pressure is applied. Pilot plunger first opens small auxiliary poppet to bleed off pressure, then main poppet is raised off its seat.
Features: Bodies of high strength iron or cast steel, bronze poppets. "O" ring static seals, socket weld pipe flange, alternate flanged ports for high pressure inlet when valve is used as a prefill check on large cylinders. Designed for heavy continuous service.

Benjamin Lassman & Son, Glenshaw, Pa.
Circle 226 on Reader Service Card

HIGH PRESSURE HYDRAULIC PUMP
. . . for aircraft

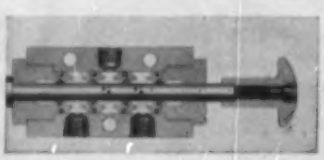
Designation: Part No. 28430
Design: Pump requires less amperage and affects a weight reduction.
Specifications: Rated pressure 3000 psi; proof pressure 3750 psi; rated capacity .5 gpm; ambient temp. range-sea level to 60000

ft; current drain, 9 amps. max. at rated pressure and voltage. 30 amps, max. inrush with locked rotor.

Adel Div. of General Metals Corp., Burbank, Cal.
Circle 227 on Reader Service Card

CONTROL VALVES
. . . have simplified construction

Designation: Quick-As-Wink
Sizes: Furnished tapped for either ⅛ or ¼ in. pipe connections.
Construction: Air and hydraulic control valves have a new interior construction that simplifies the valve and assures positive positioning of the sealing pack-



ers without placing any mechanical pressure on the packers themselves. The principal parts consist of a housing with straight through bore; gland nuts for the ends; a hollow radially ported ground and polished stainless steel plunger; internal spacers that are held firmly in metal to metal end abutment; and two sizes of "O" rings. In assembly the "O" rings are placed on the shoulders of the spacers, which are then inserted in the housing. Tightening the gland nuts positions the spacers accurately in the housing and holds the "O" rings in position without subjecting them to any mechanical pressure. The "O" ring packings are subjected only to the fluid pressure in the adjacent chambers and are supported on both their inside and outside diameters.
Specifications: Available in push-pull, push spring return, hand, foot, cam, diaphragm, pilot and single or double solenoid operated with 2-way, 4-way or 5-way actions and either open or closed exhaust.
Applications: For use in either air or hydraulic service, pressures to 125 psi, temperatures to 150 degrees F.

C. B. Hunt & Son, Inc., Salem, Ohio
Circle 228 on Reader Service Card

DIRECTIONAL CONTROL VALVES
. . . for mobile equipment

Sizes: The valve is designed in four sizes to allow flow of 8,16,23 or 35 gpm. There are 1,2,3 and 4 spool models. Single and double acting spools are interchangeable. In the smaller sizes, the de-

vice can control pressures up to 2500 psi.
Design: The spool groove on the

—At UNITED STATES STEEL

Coil cradle on United States Steel Company's Irvin Works Three-Stand Cold Reduction Mill. Marvel Synclinal Filters are a part of the mill's main hydraulic system which operates this cradle as well as other hydraulic machines.

Hydraulic pump and tank on the recoiler hydraulic system of United States Steel Company's Gary Sheet and Tin Mill's Continuous Galvanizing Line. A Marvel Synclinal Filter is installed inside the tank on the suction line.

and with hundreds of others

SUMP TYPE (Cutaway)

MARVEL SYNCLINAL FILTERS
Protect Hydraulic Equipment

In the plants of America's industrial giants, as well as in smaller plants, Marvel Synclinal Filters are being installed on all types of hydraulic and other low pressure liquid circulating equipment. Marvels are chosen because of their excellent performance in protecting machines and increasing production by reducing down-time. They are proving again and again, their superiority in the one real test—ON THE JOB! The BALANCED Synclinal Design of Marvel Filters provides that all-important balance between maximum ACTIVE filtering area and sufficient storage space for filtered out particles—therefore, longer periods of productive operation are attained at the absolute minimum of maintenance. Not only plant operators, but also, OVER 400 ORIGINAL EQUIPMENT MANUFACTURERS have recognized the superiority of Marvel Synclinal Filters and now install them as standard equipment.

Marvel Synclinal Filters, both sump and line types, may be disassembled, cleaned and reassembled by any workman, on the spot, in a matter of minutes. Line type operates in any position and may be serv ;ed without disturbing pipe connections. No spare or replacement parts to purchase or carry in stock.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Choice of monel mesh sizes ranging from coarse 30 to very fine 200.

IMMEDIATE DELIVERY

Marvel not only delivers a top grade filter in both quality and performance, but delivers IMMEDIATELY—shipments are made the same day as orders are received, if desired.

LINE TYPE (Cutaway)

WATER FILTERS In response to the great demand, we have adapted both our sump and line models for use in all water filtering applications. No changes have been made in the basic synclinal design.

MARVEL *Engineering Company*

625 WEST JACKSON BLVD., CHICAGO 6, ILLINOIS
Phone Franklin 2-4431

COUPON

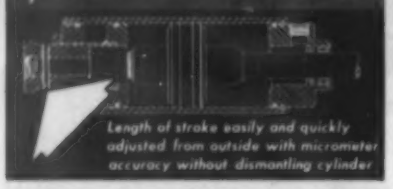
MARVEL ENGINEERING COMPANY AH-2
625 W. Jackson Blvd., Chicago 6, Ill.

Without obligation, please send me complete data on Marvel Synclinal Filters as follows:

Catalog #106 for Oil Filters
Catalog #300 for Water Filters

Name .....
Company .....
Address .....
City ..... Zone..... State.....

STANDARD
O-M CYLINDERS
QUICKLY AND EASILY
MODIFIED TO FIT
SPECIAL
APPLICATIONS



Length of stroke easily and quickly adjusted from outside with micrometer accuracy without dismantling cylinder

You don't pay for special patterns . . . and you don't have to use a cylinder that's not quite "right" for the job when you choose the O-M Cylinder. Since nearly all parts are standardized in O-M Cylinders (plus one or two semi-standard parts), the additional cost is extremely small when you need a duplex, triplex, adjustable-stroke, tandem—or any other "special" type cylinder for applications not suited to standard units.

fit where others won't!

O-M Cylinders require ½ *less installation space* than conventional cylinders of the same bore because O-M's SPECIAL INTERLOCKING MECHANISM does away with projecting tie rods and end caps. Also provides better balance, reduces distortion . . . giving O-M the *lowest coefficient of friction of any cylinder*. End plugs tapped for universal mounting. Any one or combination of mounting brackets may be used to install without disassembling or changing cylinder. Easily removed, inspected, repaired. ALL-STEEL with bearing bronze—no castings.

Available in a full range of sizes (1½ to 8" bores) with standard, 2 to 1 or oversize rods. Completely interchangeable parts.

14 day delivery on most sizes

Write today for FREE catalog and complete set of ½- and ¼-scale templates showing all cylinders and mounting brackets.

MAIL COUPON NOW!

ORTMAN MILLER MACHINE CO.

1204 150th Street • Hammond, Indiana

☐ Please send latest O-M catalog.

☐ Please send complete set of templates.

Name.....

Company.....

Address.....

City.....Zone...State....

New Products

Continued

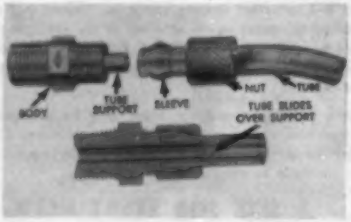
valve is coined straight down in a V-slot permitting accurate control and smooth metering action. There is full metering in all spool porting. The groove slot is described as the basis for the valve's exceptional flow metering and position control characteristics. Smooth fluid pattern from pump to cylinder ports yields accurate positioning control and positive hold. Travel speed is completely controlled. The valve has full-feathering on both open-center and cylinder ports with minimum pressure drop at full rated flow. The valve has a wide variety of applications and is simple to install and maintain.

The Parker Appliance Company, Cleveland 12, Ohio

Circle 229 on Reader Service Card

TUBE FITTINGS
. . . for plastics

Designation: Poly-Flo.
Sizes: ¼ and ⅜ in od.
Design: Fitting need only be finger tightened and tubing can readily be bent by hand. Fittings are of the compression type and consist of a brass body with integral tube support, brass nut



and polyethylene sleeve. Fittings can also be supplied in stainless steel for use with Teflon or other tubing. The integral tube support in the fitting supports the tubing in the sealing area permitting the sleeve to grip it securely.
Specifications: Styles furnished include unions, half unions, elbows, tees and bulkhead unions. There are also unions for connecting to metal tubing. Joints will hold burst pressures of .040 or .062 in polyethylene tubing, and are recommended for working pressures up to 125 psi in ¼ in od, size and 100 psi in ⅜ in. size and for temperatures from –90 to 175 degrees F. Higher pressure and temperature limits apply when Teflon tubing is used.

The Imperial Brass Mfg. Co., Chicago 7, Ill.

Circle 230 on Reader Service Card

HYDRAULIC PUMPING UNIT
. . . for low pressures

Designation: DU Series.
Design: Specially designed for use with components and systems to provide "on-the-spot" low pressure hydraulic power and volume output, suited to the

many installation requirements. Complete with motor, five gallon reservoir, breather, dip stick, overload protection and capacitor, relief valve set for 200 psi and needle bearings for continuous service.

Modernair Corporation San Leandro, Cal.

Circle 231 on Reader Service Card

SILENCERS
. . . quiet noise of compressor, blowers, pumps

Designation: Series "CA" and "LCA".
Sizes: The "CA" Series is available in pipe sizes up to 6 in., the "LCA" Series in sizes larger than 6 in.
Design: Two new series of silencers quiet the noise produced by air compressors, blowers, vacuum pumps and other machines expelling high velocity air to atmosphere. They are designed for

Circle 60 on Reader Service Card
Circle 22 on Reader Service Card

NEW!

conpor KILLS LEAKS

most important development in sealing and packing material since the invention of the oil seal

Conpor is the result of a six-year development program. It is specially tanned Sirvis leathers, impregnated with liquid polymers, to provide assured control of porosity. Conpor has all the advantages of leather—flexibility, strength, stability, and oil and solvent resistance; it permits lubrication through the seal or packing member—with a controlled porosity range of from zero to 100%. Eighteen months of field experience and hundreds of tests run by C/R's Engineering Department have established beyond doubt the extreme superiority of Conpor impregnations over any other leather sealing member presently available.

conpor offers you these advantages

- *Complete leakage control.*
- *Less shaft scoring from oil seals.*
- *Designing for lower torque.*
- *Reduced original costs in most cases.*
- *A stable material with broad resistance factors.*
- *Many times the service life of previous leathers.*
- *Better lubrication control at points of friction.*

Send for this! *"Report on Conpor" gives all basic information on this vital new material. Our engineering service will be glad to work with you in developing Conpor sealing products for your applications. Write: Mr. A. S. Berens, Chicago Rawhide Manufacturing Co., 900 North State, Elgin, Illinois.*

75 C/R

conpor

CONTROLLED POROSITY

SIRVIS MECHANICAL LEATHER

CHICAGO RAWHIDE MANUFACTURING COMPANY

900 North State CONPOR DIVISION Elgin, Illinois

Representatives in these Principal Cities: Boston • New York • Syracuse • Buffalo • Philadelphia • Pittsburgh • Cincinnati • Cleveland Detroit • Peoria • Minneapolis • Wichita • Tulsa • Houston • Los Angeles • San Francisco • Seattle

Other C/R products

Oil Seals: Shaft and end face seals for all types of lubricant retention and dirt exclusion • Sirvene (Synthetic rubber) diaphragms, boots, gaskets, and similar parts for critical operating conditions • Sirvis: Mechanical leather packings and related products.

KOBE Heavy Duty High Pressure

Triplex Pumps

Case History A 4: In August, 1943, the Adel Division of General Metals Corporation installed 3 Kobe Triplexes for testing hydraulic equipment at pressures from 2500 psi to 5000 psi.

The equipment was designated for 2 distinct types of service:

(A) Intermittent operation—production testing of hydraulic equipment for aircraft.

(B) Continuous operation—running destruction tests on new designs.

Convincing proofs of the satisfactory performance of the Kobe equipment are subsequent Adel orders for 3 additional Triplex units—2 installed Sept., 1948, and the 3rd, April, 1951.

When the need is for high pressure hydraulic power "in a package," specify Kobe.

Features:

- Pressures—To 5,000 psi (standard) To 20,000 psi (special)
- Volumes—To 60 g.p.m.
- Power Ratings—15, 30, and 50 H.P.
- Integral Double Reduction Gears
- Integral Electric Drive (optional)
- Easily Interchanged Plungers and Liners
- Built-in Pressure Lubrication
- Easily Accessible Ball Type Check Valves

Write for Bulletin

KOBE INC., Division of Dresser Equipment Co., 615 NBC Bldg., 815 Superior Ave., N.E. Cleveland 14, Ohio

KOBE INC.
Division of Dresser Equipment Co.
Plant: Huntington Park, Calif. — Representatives in CLEVELAND, Pittsburgh, New York, Houston, Oklahoma City.

New Products

Continued

operation under moisture-free air conditions and for temperatures up to 200 degrees F. Both series are absorption type silencers employing straight-through, acoustically transparent perforated tubes surrounded by a deep layer of special, highly efficient, sound absorbing material, and therefore, feature minimum restriction to air flow. Special sound material can be used for operation at considerably higher temperatures than the standard of 200 degrees.

Burgess-Manning Company, Libertyville, Illinois
Circle 232 on Reader Service Card

BUNA N COMPOUND
. . . has wide temperature range

Designation: Buna N Compound 1225

Properties: Outstanding properties as to heat resistance (300-325 F), good oil resistance properties and very low compression set at elevated temperatures. It is also flexible as low as –40 F. Other high physical properties include tensile strength of 2500 psi, elongation of 350 per cent and durometer of 70 points.

Application: Ideal for seals in transmissions, power steering and like applications. It is suited for fabricating into any type of industrial rubber part.

Goshen Rubber Co., Inc., Goshen, Indiana
Circle 233 on Reader Service Card

RE-USABLE HYDRAULIC COUPLING
. . . for connecting hose and tubing

Designation: Stemlok

Sizes: ¼ in. ID to 2 in. ID

Features: The coupling permits maximum use of low cost tubing and eliminates the need for special adaptor couplings. In as much as 360 degree rotation of tube is allowed after assembly, easy positioning is assured and very close tolerances are unnecessary. Fast, easy assembly and

90 degree tube bends within ½ in. of coupling nipple are other features of the coupling. The coupling is guaranteed to withstand burst pressure of hose without danger of bead collapse or blowout. An "O" ring seal prevents static or impulse pressure leaks.

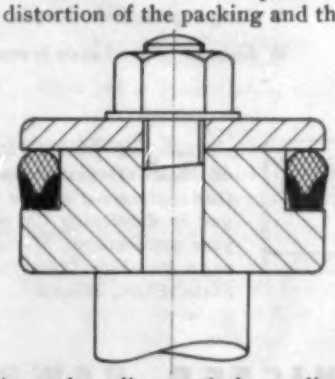
Maeward Couplings, Inc., Olivet, Michigan
Circle 234 on Reader Service Card

FLUID SEALS
. . . combines "O" ring and "U" ring

Designation: Hallprene

Design: The seal is molded with slightly divergent walls and because the filling is resilient the walls of the packing ring will not tend to collapse and once put under pressure will maintain a pressure and retain a seal even though the fluid pressure falls to zero.

Construction: The fluid seal has been devised to overcome certain disadvantages of the "U" type of packing ring, such as wear at the heel due to fluid pressure distortion of the packing and the

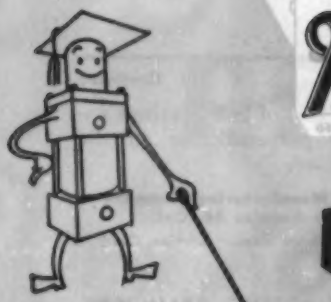


inwards collapse of the sealing lips. The seal is of synthetic rubber impregnated fabric in the form of a "U" ring and filled with a soft and resilient synthetic rubber, the whole bonded together. The composition is im-

Circle 46 on Reader Service Card
Circle 53 on Reader Service Card

Miller

FLUID PRESSURE BOOSTERS

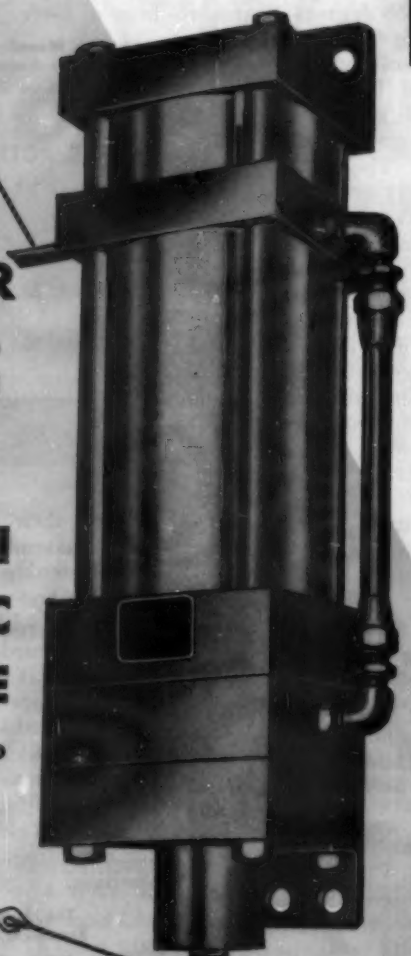


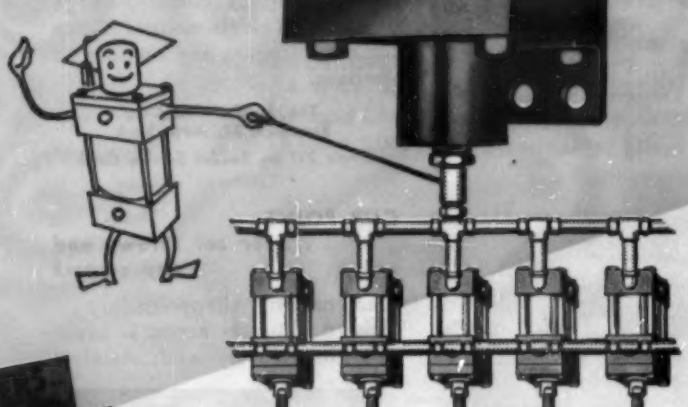
BOOST 80 PSI AIR

Input Range: 40 to 3000 psi Air or Fluid

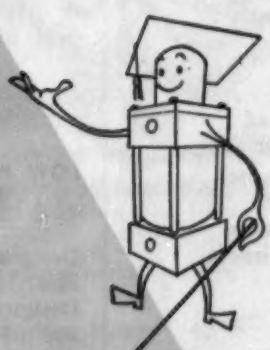
TO 2000 PSI HYDRAULIC PRESSURE

Output Range: 200 to 10,000 psi Fluid





- Save space, weight and investment cost by replacing pump installations in many applications
- Less costly to install, operate and maintain
- **Hold pressure indefinitely** without the motion and heat generation of ordinary pump circuits
- Provide — at point of cylinder thrust — more efficient power with less weight in less space than direct driven air cylinders
- Save up to 95% of air consumed by direct driven air cylinders
- Operate at speeds of 30 to 450 strokes per minute



ESPECIALLY RECOMMENDED FOR

- **WELDING**
- **PUNCHING**
- **SHEARING**
- **CLAMPING**
- **RIVETING**
- **CRIMPING**
- **PRESSING**

and similar applications

FULL DETAILS IN MILLER BULLETIN B-200 SENT FREE ON REQUEST
Other Miller products include: Air cylinders, 1½" to 20" Bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

Miller

MILLER MOTOR COMPANY

2008 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

Pantex manufacturing corporation...

... established in 1927 and one of the largest manufacturers of hydraulic valves for aircraft manufacturers, has available an unusually effective and adaptable line of hydraulic controls for industrial applications.

Designed, engineered and manufactured to highest performance standards, each Pantex unit is analyzed, tested, and inspected in one of the most modern hydraulic laboratories.

Literature available.

Pantex
MANUFACTURING CORPORATION

... specialists in hydraulic controls

pervious to the action of hydraulic fluids up to a temperature not exceeding 250 degrees F and is most efficient for use against air. In use, the soft synthetic rubber is deformed by fluid pressure causing the sealing surface of the fabric impregnated side walls to expand. The soft radiused face of this type of seal must be towards pressure when fitted. The construction of the seal is such that the sealing lips of the "U" ring are protected against damage by being bonded to the resilient filling. The rounded exposed surface of this filling helps to ensure, that when in a stuffing box the fluid pressure can readily reach all parts of the exposed surface.

Application: The seal has been found particularly suitable for use with shafts which are slightly out of alignment or in hydraulic cylinders which have become oval with wear.

Hall & Hall Ltd.,
Middlesex, England
Circle 235 on Reader Service Card

LOW PRESSURE JOINT
. . . has ball bearing swivel fitting

Designation: Type LPR.
Size: 1¼ to 4 in.
Design: Designed for application and pressures to which schedule 40 pipe would be subjected, and

for a maximum pressure of 1000 psi at a maximum temperature of 225 degrees F. Other types are available for pressures up to 15000 psi and temperatures to 750 degrees F.

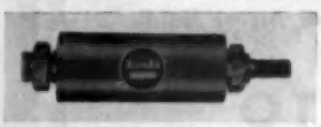
Features: The outstanding feature of the swivel fitting is its free turning qualities. The thrust load is taken directly through the center of the balls. The hardened and ground races on which a double row of ball bearings rotate are perpendicular to the lines of force.

Rmsco Manufacturing Company
Los Angeles 54, Cal.
Circle 236 on Reader Service Card

DOUBLE ACTING CYLINDERS
. . . for air, water, hydraulic oils

Size: 1⅛, 2 or 3 in. bore, any stroke and with either single ended or double ended piston rods.

Construction: Compactness as



well as their ease of assembly and disassembly is achieved by the fastening of the heads, squarely and rigidly, to the cylinder tube with rectangular section, hardened steel, snap rings reground flat and parallel and to .001 tolerance on thickness. Adjustable cushions are available front or back on the 2 and 3 in. sizes and an assortment of interchangeable foot mounts, flange mounts and clevis mounts allows for mounting in any manner or position.

The A. K. Allen Co.,
Brooklyn 22, New York
Circle 237 on Reader Service Card

CUP POINT
. . . for set screws and cap screws

Designation: Allenpoint.
Design: The set screw is available in Allenoy and stainless

steel, with either NC or NF threads. The company's standard line of oval, flat, cone and dog point set screws will continue to be available as standard stock items.

Circle 62 on Reader Service Card

performance!

with the Pantex cartridge type industrial relief valve

350 p.s.i. to 5,000 p.s.i.

Cartridge design permits rapid servicing *without* breaking line, thus *reducing downtime and maintenance cost!*

Also available—

¼" DIRECTLY OPERATED 4-WAY VALVES
Solenoid Controlled
100 — 5,000 p.s.i.

¾" PILOT OPERATED 4-WAY VALVES
Remotely Controlled
100 — 5,000 p.s.i.

¾" PILOT OPERATED 4-WAY VALVES
Solenoid Controlled
100 — 5,000 p.s.i.

. . . hydraulic control specialists . . .

- ***Pilot Type Operation*—pilot integral part of main valve**
- ***No chatter, squeal or wire-drawing***
- ***Unprecedented REPEAT ACCURACY*—throughout pressure and flow ranges**
- ***Opens and closes within a 10% differential***
- ***Wide Temperature Range, —65°F to +160°F***
- ***Right angle port arrangement***
- ***Mehanite body, stainless steel working parts***

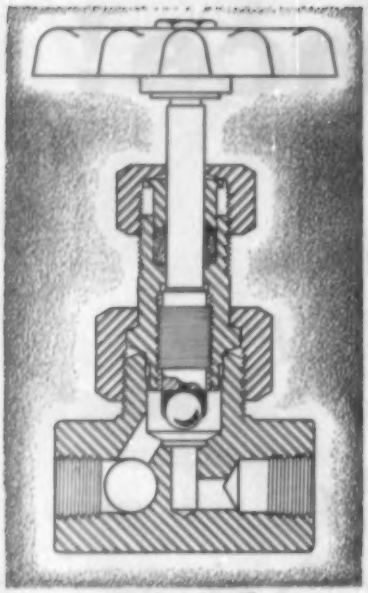
Available with pressure and relief ports tapped for ¼", ⅜", ½", and ¾" pipe.

If you have a problem involving relief valves, write, wire or phone.

since 1927

Pantex

MANUFACTURING CORPORATION
PAWTUCKET, RHODE ISLAND



NEW!

BALL VALVE for liquids, gas or steam

Here's a radically-new forged steel valve for general heavy industrial use. Can't leak . . . practically never wears out . . . costs little or no more than ordinary valves!

In place of a disc or plug, the new Foxboro Ball Valve has a retained, free-rolling stainless steel ball that exposes new surface to seat at every closing.

Foxboro Ball Valves handle pressures to 3000 psi. Available in straight-thru and angle types. Two or four connections to simplify piping. ¼" size. Write for detailed folder.

The Foxboro Company,
212 Norfolk Street,

FOXBORO
REG. U.S. PAT. OFF.
INSTRUMENTATION

Foxboro, Mass., U.S.A.

 Circle 100 on Reader Service Card

New Products

Continued

Features: This new point was tested comparatively with standard cup point set screws and screws with angled and serrated points. The new point demonstrated great locking at all measured installations vs. removal torque pressures, uniformly high shaft holding power in torque resistance tests.

The Allen Manufacturing Company, Hartford, Conn.

Circle 238 on Reader Service Card

SEQUENCE VALVE
. . . for precision interlocked operations

Size: Supplied in threaded body style in ½, ¾, 1¼ in. Subplate type is available in ¾ and 1¼ in., and the flange body is supplied in the 1½ in.

Design: Pressure build up in the system brings immediate action of the pilot piston in the secondary circuit, which may be adjusted to shift at any pressure from 25 to 2000 psi. The use of the small pilot piston eliminates need for heavy spring loading at high pressures. The response is

positive and control is close. The secondary operation begins when the pressure reaches the presetting of the valve. These sequence valves are externally drained direct to tank. The valves are designed for operation in the 25 to 125 psi and 75 to 250 psi ranges do not utilize the pilot piston. The pilot pressure is directed against the large area of the spool. This results in extreme sensitivity to pressure changes in the low pressure ranges. Pres-

★ONLY THREE PARTS
★MEETS J.I.C. STANDARDS
★GREATER FILTERING AREA
★SPECIAL TRAP-WEAVE MESH

The New

CAPITAL HYDRAULIC OIL FILTER

WITH MONEL METAL INSERT

Reservoir Type for Hydraulic and Oil Re-Circulating Machinery

EASY TO INSTALL • EASY TO CLEAN • LONG LIFE • LOW COST

SIZES AND SCREENS TO FIT YOUR NEEDS

CAPITAL ENGINEERING & MFG. CORP.
5837 South Ashland Avenue Chicago 36, Illinois

Circle 18 on Reader Service Card

sure ranges are 25-125 psi, 75-250 psi, 125-500 psi, 250-1000 psi and 1000-2000 psi.

Applications: The line provides precision control for inter-locked hydraulic operations insuring close synchronization of primary and secondary operations, The pressure setting of the valve is easily adjusted. When system pressure reaches the pressure setting of the valve, oil is diverted to the secondary circuit.

The Denison Engineering Company, Columbus, Ohio

Circle 239 on Reader Service Card

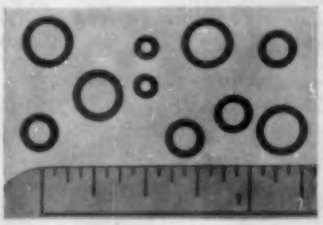
SUBMINIATURE "O" RINGS ... for pressure sealing

Designation: 6227 Series.

Sizes: Stock sizes, .029 x .040 x .109 in.; .070 x .040 x .150 in.; .100 x .070 x .240 in. for either moving or non-moving seals.

Design: The "O" rings have wide range of pressure, temperature and movement, better sealing in both directions of pressure flow and longer sealing life. They are easily adapted to a variety of sealing applications and have low running friction.

Applications: Designed to meet the precise space requirements



of aircraft, airborne equipment, guided missiles and rockets, they are now available to automotive, aviation and machinery industries for use in pumps, valves, nozzles and general industrial hydraulic applications.

Stillman Rubber Co., Culver City, Cal.

Circle 240 on Reader Service Card

IMPREGNATED LEATHER ... gives controlled porosity

Designation: Conpor

Design: The potential control in impregnated leathers ranges from 0 to 100 percent. They are

You need not pay a High Price for a SHORT RUN of PISTON RINGS

It is not necessary to pay a high price for a short run of piston rings. Auto-Diesel have specialized since 1921 in making quality rings in small quantities and selling them at ATTRACTIVE PRICES. We are set up for this kind of business and have developed efficient methods that enable us to turn out quality rings, economically. Can make up to 35" diameter for original equipment and for replacement in compressors, hydraulic cylinders, valves, etc. We also make circular parts to your specifications. Write for prices.

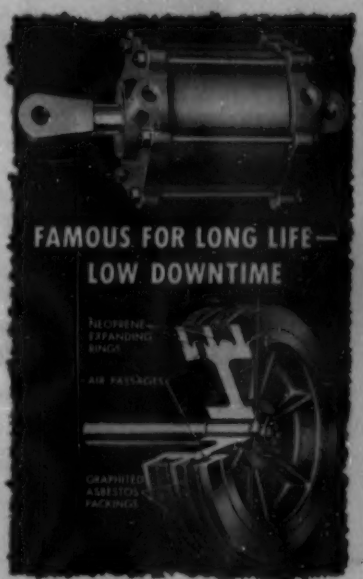
Use LONG-WEARING AUTO-DIESEL Precision Made SCRAPER RING AN 6231 . . 1 to 71

Auto-Diesel Bronze Scraper Rings are precision made by men who have specialized in work of this kind since 1921. For that reason they are LONG-WEARING and will reduce down-time to the minimum. Can supply sizes from ⅛" to 13" I.D. Auto-Diesel Bronze Scraper Rings assure longer life of components used with pistons. We make rings and circular parts for jet engines. Write Auto-Diesel Engineers regarding any piston ring problem.

Write for Details

THE AUTO-DIESEL PISTON RING CO.
3137 Superior Avenue • Cleveland 14, Ohio
"RINGS and SHAPES Since 1921"

S-P
AIR CYLINDERS



PISTON PACKINGS "REPLACE" THEMSELVES

Compressed air expands Neoprene Rings, keeps Graphited Asbestos Packings under constant pressure. Packings automatically compensate for gradual wear . . . practically eliminates repacking downtime.

Precision-made in a wide range of models, 2" to 12" bore. Representatives in principal cities. Prompt deliveries. Send for copy of S-P Catalog No. 102.

S-P HYDRAULIC CYLINDERS

11 models in 11 sizes
Packing cartridge • J.I.C. Standards
2000 p.s.i. *Every modern design feature*
Send for Catalog No. 103.

OTHER S-P PRODUCTS: Power Chucks, Rotating Air Cylinders, Parallel Grip Collet Chucks, Drill Press Chucks, Expanding Arbors, Blank Jaws, Air Valves, Air Pistons, Air Control Accessories.

THE S-P MFG. CORP.
1245 EUCLID AVENUE
CLEVELAND 6, OHIO
A Bassett Company

Continued

available in full thickness or limited-depth impregnations and within each of these catagories is a variety of formulae whose use is governed by the liquid or gases to be sealed. Leak-proof efficiency of various Conpor leathers are the static tests run on discs using an SAE oil at 4 psi, within the same time limit an untreated leather leaked 179 grams of oil, while the new leather leaked only 3.2 grams.

Features: Essentially the impregnation of chrome retan leathers with oil resistant liquid polymers, followed by further polymerzation within the leather, the new material affords an ideal seal for oil that retails all the good properties of leather. It has flexibility, strength, stability, resistance to oils and solvents and is flexible at low temperatures.

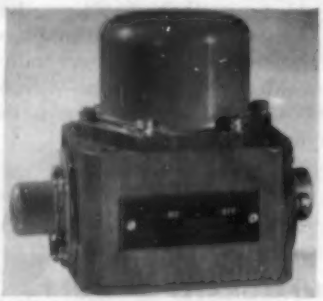
Chicago Rawhide Manufacturing Company
Elgin, Illinois

Circle 241 on Reader Service Card

SERVO VALVE
. . . controls desired output flow

Designation: Model 500.

Design: Exceptionally high speed of response and accuracy are provided by this valve which consists of a group of proportional type electrically actuated hydraulic 4-way valves featuring



no mechanical linkage. These valves are designed to control any maximum desired output flow from .5 to .8 gpm in hydraulic systems from 1000 to 3000 psi. Standard signal input for full output flow is a differential current of ± 8.0 milliamperes, with lower or higher signal levels. The valves have a frictionless first stage push-pull hydraulic amplifier which requires a continuous oil flow of .1 gpm. This oil is internally filtered by sintered bronze and magnetic traps.

Specifications: The valve body is constructed of aluminum alloy. The floating type bushing and spool assembly are made of hardened steel. The valve is only 2-7/16 in. high by 3-1/16 wide and 1-3/4 in. deep.

Applications: These small light weight valves are used in control systems requiring high accuracy such as machine tools, paper making and textile machinery and other processing equipment, or requiring high speed of response such as automatic packaging machinery, aircraft and guided missiles.

Moog Valve Company,
East Aurora, New York

Circle 242 on Reader Service Card

NICHOLSON AIR-GAS-STEAM TRAPS

NEVER NEED PRIME

Nicholson weight-operated traps, under no condition, leak pressure medium. This prevents the costly loss of air, gas or steam occurring when inverted bucket traps lose their prime. Nicholson traps hold tight because they have a positive water seal and do not depend on buoyancy of float to raise valve. Other features: exclusive new oil-eliminator; special hardened stainless steel valve. 3 types; pressures to 200, 500 and 1500 lbs. . . . Send for Nicholson. . . .

CATALOG 953

213 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

Circle 57 on Reader Service Card

You can depend on

Ace Products

—Reliable Since 1935!

Fall Wiper Ring SPRING LOADED

Used During World War 2 and ever since by the Military
Fall Wiper Rings Spec. MIL-S-5049 are AN Approved.
Covered by pat. issued and pat. pending.

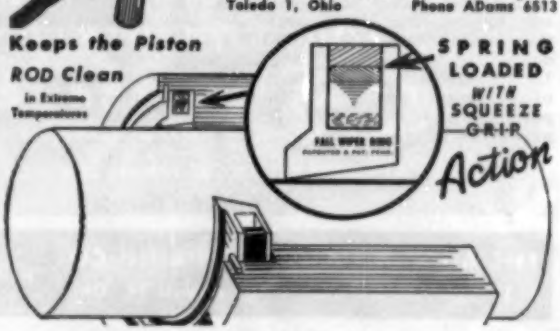
Squeeze Grip Action Does It—PATENTED

The 3-piece Fall Wiper Ring assembled into one piece as covered by patents consists of (1) a one-piece Split Wiper Ring (body) with two flanges or groove in its O.D.; (2) a one-piece split compressor spring assembled in the groove; (3) an endless cover band surrounding the spring in the groove which causes a squeeze grip action on the piston rod.

The Fall Wiper Ring is available from ½" to 13" dia. Military part numbers from AN6231A1 to AN6231A71. Write, wire or phone us regarding your wiper needs.

Ace Products Company
Toledo 1, Ohio Phone ADams 6513

Keeps the Piston ROD Clean in Extreme Temperatures



Circle 1 on Reader Service Card

LOOK

RIVETT OFFERS *NEW*

Series 6600
Solenoid Pilot Operated.
Furnished in 1/2", 3/4", 1" 1-1/4" and 1-1/2" I.P.S.

gasket-mounted hydraulic valves

4-way 3000 p.s.i.

Designed and Built to J.I.C. Standards

Advanced features offer you broader opportunity for control

Series 6500
Direct Solenoid Operated.
Furnished in 1/4" I.P.S.

1. Greater flow capacity. (Ex: 6600 series ¾" size rated at 28 G.P.M. at 15 ft. per sec.)
2. Less pressure drop.
3. More compact in size.
4. Seven spool designs for 3 and 4-way control.
5. Dust sealed and moisture resistant. Roomy wiring box.
6. Continuous duty, shock mounted solenoids. 3.6 amps inrush and .45 amps holding at 115 V.
7. Shock resistant spool. Scalloped design and metering grooves eliminate impact.
8. All surfaces precision ground.
9. May be mounted in any position.
10. High tensile, nickel alloy body.

RIVETT LATHE & GRINDER, Inc.
Brighton 35, Boston, Mass.

COMPARE and PROVE!
Get new Catalog —

shows *why* new Rivett gasket-mounted solenoid pilot valves are best; illustrates flow operations for all piston designs. This book is a must on every board—easy to understand, it will simplify your valving problems. Write today!

Rivett Lathe & Grinder, Inc., Dept.
Brighton 35, Boston, Mass.
Please send free Catalog 260.-

Name_____

Company_____

City_____ State_____

RIVETT **furnishes a complete power package**

VALVES • CYLINDERS • POWER UNITS

Air and Hydraulic • All sizes and types

HONAN-CRANE OIL PURIFICATION

cuts hydraulic maintenance costs in half!

● H-C Purifiers keep oil clean and safe to use indefinitely . . . prevent excessive wear of pump parts . . . eliminate clogging and sticking of control valves, pistons and other vital mechanisms. Many plants have reduced hydraulic maintenance costs 50% or more and gained 4 to 5 times longer oil life with Honan-Crane purification.

HONAN-CRANE HYDRAULIC OIL PURIFIERS

Available for direct connection to individual machines, or as mobile units for general service. Automatically removes all abrasive contaminants and corrosive products of oxidation from oils used in presses, machine tools, etc.

HOUDAILLE DRI-PURE WATER-OIL SEPARATOR

Compact unit removes moisture from vacuum pump oils . . . cuts pump-down time in half. Filters out contaminants as it separates water. Keeps oil clean and dry, and enables pump to provide a high vacuum without oil change.

Increase the efficiency of your hydraulic equipment. Write today for free 8-page Honan-Crane Hydraulic Bulletin.

HONAN-CRANE CORP.
102 Wabash Ave., Lebanon, Indiana
a subsidiary of
HOUDAILLE-HERSHEY CORP.

New Products

Continued

AIR MOTOR
. . . has axial piston design

Designation: 70A Series
Features: Compact and instantly reversible, the new air motors are available in ratings from ½ to 2-¾ hp, in twelve combinations of speed and torque. Air consumption varies from 21 cfm in the smallest to 83 cfm in the largest size motor.
Application: Absolute immunity

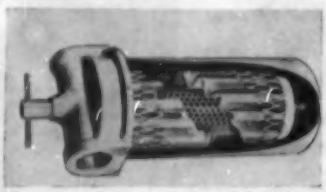
to burnout when stalled, ideally suits the new motors to such applications as valve closing, in agitators, tilting tables and as variable speed drive for overhead cranes. Continuously variable speed control, from zero to full, plus fredom from spark hazard, make the air motors suited for production applications. Consistent torque output is achieved on low as well as high air pressure.

Keller Tool Company, Grand Haven, Mich.

Circle 243 on Reader Service Card

WATER FILTERS
. . . added to filter line of products

Sizes: Units from 5 to 100 gpm.
Features: Maximum active filter



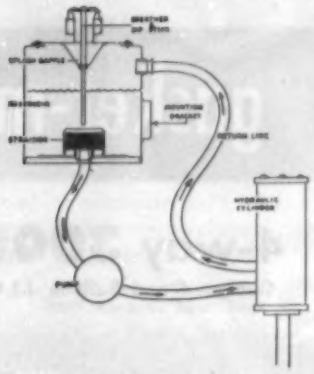
area, longer periods of operation, no moving parts, simplicity of maintenance. Choice of mesh sizes ranging from coarse 30 to very fine 200 to handle various size particles.
Application: All models of sump and line type filters have recently been adapted for water applications. No changes have been made in the basic synclinal design.

Marvel Engineering Co., Chicago 6, Ill.

Circle 244 on Reader Service Card

PACKAGE HYDRAULIC RESERVOIR
. . . includes tank, breather and strainer

Design: A "package" system which includes storage tank, air vent breather, dip stick, splash



baffle and fluid strainer. Available in 2½ gal. supply capacities (or to the user's specifications), the hydraulic reservoir is of all welded design and shock tested to insure field performance. A mounting bracket is supplied, if required. The manufacturer cites as a special advantage the package design of the reservoir, eliminating need for separate purchase and installation of breather, strainer and other components.

Cronio, Inc., Rochester, Minn.

Circle 245 on Reader Service Card

FAN COOLED MOTOR
. . . has high velocity

Design: This motor incorporates a high-velocity internal cooling fan. Because of its greater cooling capacity, much higher horsepower ratings can be obtained from lower cost small size frames. The fan is mounted on the motor's shaft and is housed within the special fin-type end-

bell. Air is sucked in through a screen filter opening and blown with great force over all internal areas.

Features: Motors are available in ratings from 15 hp up to and including 30 hp. All units feature a drip proof construction and can be furnished with either a standard single-end shaft or special hydraulic pump mount end-bells.

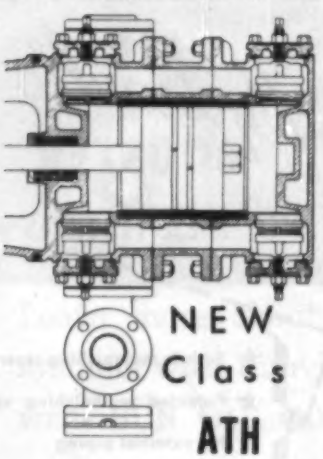
Reuland Electric Company, Alhambra, Cal.

Circle 246 on Reader Service Card

COMPRESSOR
. . . has valves in heads

Designation: Class ATH

Design: Air and gas compressors employ sectionalized cylinders in three pieces and with the inlet and discharge valves in the front head and back head. All are equipped with cylinder-



liners as standard. Cooling water passages may be thoroughly cleaned, since the passages are immediately accessible. Valves in the heads with this new sectionalized cylinder construction allow better cooling and provide lower temperature throughout the cylinder and valves. The cooling jackets are adjacent to the cylinder heads. The maxi-

LET Valvair Substitute Air for Muscle!

Slot-milling on Horizontal Milling Machine

Move lever of Valvair (D) to start cycle. Air cylinder (A) advances table to work. After cut, limit switch (F) actuates pilot valve (E), which returns valve (D) and cylinder (A) to starting position. Cam-operated Valvair (G) indexes part for next cut.

"Cut it out!"

☐ MORE INFORMATION ON VALVAIR LINE
☐ BULLETIN "A-2" ON NEW SOLENOID PILOT VALVE

Name, title_____
Company_____
Address_____

All air control valves and the installation are by Valvair. Valvair's basic body design fits nine control assemblies. Internal parts are also interchangeable. Valvair *Diversatility* puts real flexibility into your plant operation. Let Valvair engineers or your local Valvair representative assist with your pneumatic circuit problems.

★ ★ ★

The Valvair Speed King line is complete — 3-way, 4-way, 4-way-5-port (2-pressure), foot-mounted or sub-base manifold mounted; pipe sizes — ¼", ⅜", ½", ¾", 1". A precedent-breaker in size, weight, speed and endurance.

VALVAIR CORPORATION, 951 Beardsley Ave., Akron 11, Ohio

Valvair DIVERSATILITY

Circle 91 on Reader Service Card

Continued

mum temperature rise occurs at the end of the stroke adjacent to the cylinder heads and the design incorporates increased cooling surface and provides cross-flow of the cooling water.

Pennsylvania Pump and Compressor Company, Easton, Pa.

Circle 247 on Reader Service Card

SNAP-ACTION SWITCH . . . features one-way impulse action

Designation: ES4-KM2.

Design: This switch frequently eliminates the need for time de-

lay relays, complicated actuating dogs and additional switches. In a switching operation where a pulse to a solenoid or starter is needed, the switch sends the controlling electrical impulse and then drops completely out of the circuit. This allows the solenoid valve to return after it receives an electrical impulse from the circuit controlling the return solenoid. There is a choice of five "on" periods, from 1/16 to 3/8 in. The switch completes the circuit for a pre-determined part of the plunger's forward stroke, then gives release to the impulse as the plunger advances. No further action results for the remainder of the plunger's overtravel or return stroke.

Applications: Control of automatic sequence movements, safety interlocks, positioning switches, limiting action of machine members, pulsing electrical counters, initiating time cycles and many other industrial uses.

Electro-Snap Switch & Mfg. Co., Chicago 24, Ill.

Circle 248 on Reader Service Card

2-, 3-, and 4-way Valves . . . have solenoid actuating device

Design: This solenoid is of the secondary pilot operating type in which a relatively small solenoid controls a pilot cylinder in the valve, to provide the fast positive force for shifting the valve spool.

The new solenoid may be repositioned by spring return or by any other actuating devices among which are hand, cam, pilot and foot, or a second solenoid may be employed for this purpose. Four way double solenoid valves may be spring centered, with numerous arrangements of the pressure spools which con-

MODERN air fluid POWER

BV SERIES VALVES
¼ INCH PORTS 3 WAY & 4 WAY

• FOOT CONTROL MODEL—SAME PEDAL AND BASE FOR 3 WAY & 4 WAY VALVES

• SINGLE AND DOUBLE CAM STEM MODELS
• TYPES: CAM—SPRING RETURN—PILOT PRESSURE ACTUATION—PRESSURE RESET.
• CONTROL FEATURES: SINGLE & DOUBLE CAM—SINGLE & DOUBLE ROLLER CAM—HANDLE—FOOT PEDAL — PALM BUTTON.

WRITE FOR CATALOG
STOCKS IN PRINCIPAL CITIES

CYLINDERS
CONTROL VALVES
PILOT VALVES

All components required for complete automatic and sequence circuits:

Engineering of control circuits

Modernair CORPORATION

THE MOST VERSATILE AND COMPACT AIR Hydraulic BOOSTER WITH THESE FEATURES ★

★ Built-in replenishing reservoir
★ Patented replenishing valve
★ No external piping
★ Threaded or manifold mounted types

Any size or capacity . . . either air or oil powered . . . for any type fluid displacement . . . . . up to 50,000 psi output.

CENTURY HYDRAULICS, INC.

Circle 55 on Reader Service Card

Circle 21 on Reader Service Card

Dirty Hydraulic Systems cleaned in 50 hours or less by SUNVIS H.D. 700 OILS

No Loss of Production

Sunvis H.D. 700 Oils

- **remove sludge and gums without affecting packings**
- **pick up contaminants and carry them to the filter**
- **prevent rusting of clean parts**
- **are available in viscosities to suit all hydraulic pumps**

Learn more about the advantages of cleaning dirty hydraulic systems with Sunvis H.D. 700 Oils. Call your local Sun Office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AH-2.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Continued

trol the flow. No additional line is required for the solenoid pilot cylinder when solenoid valves are used for pressures up to 125 psig, since these valves are internally drilled to supply main line air or fluids to the solenoid pilot. For controlling hydraulic pressures over 159 psig up to 500 psig an auxiliary low pressure line of 35 to 150 psig is needed to supply the solenoid pilot.

Features: All internal parts are interchangeable in the 2-, 3-, and 4-way types, and can be completely serviced or disassembled without disturbing pipe connections. Among the outstanding features of the valve is the anti-extrusion arrangement of all the "O" ring seals in each valve type which accounts for their airtightness after more than three million cycles of operation.

Versa Products Company, Inc., Brooklyn, New York

Circle 249 on Reader Service Card

Your Superior Distributor has a stock like this...

of Superior JIC hydraulic quality low carbon steel tubing

In answer to many queries, "Can I buy JIC hydraulic tubing from a local warehouse?" we say "Yes!" A number of Superior distributors stock for prompt shipment JIC hydraulic quality carbon steel tubing in standard O.D. and wall sizes from 1/8" to 3/8".

Superior Hydraulic Tubing is NON-AGING, cold-drawn seamless, dead-soft annealed. Interior is smooth and clean. Carbon content is 15% max., max. wall thickness .125".

All Superior hydraulic tubing is 100% hydrostatic tested before shipment and each order is tested for flareability. Write for your copy of our new folder with sizes, wall thicknesses, and maximum working pressures.

Your Superior distributor below will quote you prices and delivery, help you select the proper tubing for your job.

Superior
THE BIG NAME IN SMALL TUBING

Superior Tube Company
2030 Germantown Ave., Norristown, Pa.

• *Superior distributors who carry warehouse stocks of JIC Hydraulic tubing:*

AUSTIN-HASTINGS CO., INC.
Cambridge, Mass.

PETER A. FRASSE & CO., INC.
Buffalo, New York, Philadelphia, Syracuse

HYDRAULIC POWER EQUIPMENT CO.
Portland, Oregon

LYMAN TUBE & BEARINGS LTD.
Montreal and Toronto, Canada

C. A. ROBERTS CO.
Chicago, Detroit, Indianapolis, St. Louis, Tulsa

STANDARD BRASS & MFG. CO.
Houston, New Orleans, Shreveport

STRONG, CARLISLE & HAMMOND CO.
Cleveland, Ohio

WILLIAMS & CO.
Cincinnati, Pittsburgh

HYDRAULIC PRESSURE BOOSTER

. . . intensifies pressure of water supply

Construction: The booster is operated by your plant on city water pressure or by air pressure. No engines, no motors, no pumps, belts etc. are needed. It generates pressures to any desired point up to 25,000 psi. depending upon pressure available for operation and area ratios of

pistons. The booster consists of unit pistons which operate in unit cylinders. The pistons are packed with a sealing member which is low in friction but which will not leak. Any predetermined pressure may be generated and maintained indefinitely.

Sizes: Three types are available; 5000 and 10,000 psi. discharge pressure for operation on plant pressures of 150 psi. air or water and 25,000 psi. discharge pressure for operation on 225 psi. plant or source pressure.

Operation: Control is effected manually by means of conventional needle which when manipulated allow low pressure from pressure source to enter lower booster cylinder. As the cylinder is forced upward the high pressure cylinder generates and discharges high pressure in the exact ratio to piston areas.

Application: For testing hydraulic manifolds, valves, fittings, blow-off valves and for instrument calibration.

Martin-Decker Corporation, Long Beach, California

Circle 250 on Reader Service Card

ALL Pathon Hydraulic Cylinders Series RH 2000 P.S.I. or QH 1000 P.S.I. are designed to provide maximum strength and fatigue life in a minimum of mounting space. The use of a single screw thread to attach the head to the body of the cylinder assures smallness in physical size and at the same time gives low stress concentration throughout the barrel to head attaching area with a resultant *plus factor* for shock loading. *Your* Pathon Hydraulic Cylinders are more compact, stronger and yet require less maintenance.

Pathon
HYDRAULIC CYLINDERS

You get
EXTREME COMPACTNESS
EXCEPTIONAL PERFORMANCE

A MAXIMUM of operational efficiency in minimum space is characteristic of Pathon Series H4W Hydraulic remotely operated directional control valves. They are easy to install, convenient and inexpensive to use, and require an absolute minimum of maintenance attention.

Write us today for your Pathon Oil Hydraulic Cylinder and Valve Bulletin No. 22.

Pathon
HYDRAULIC VALVES

Pathon MANUFACTURING CO.

3823 Pacific Avenue Cincinnati 12, Ohio

Post Scripts of Industry

News about people, manufacturers and sales organizations

Eric M. Lipman
Cardwell Machine Co.

Leslie C. Street
Graton & Knight Company

Fred W. Gottschling
Greer Hydraulics, Inc.

Eric M. Lipman, former sales and export manager, has been appointed vice president in charge of sales by **Cardwell Machine Company,** Richmond, Va. The announcement was made by Walter W. Craigie, company president. Mr. Lipman recently returned from an extended trip to Europe to acquaint manufacturers with the latest developments in American processes.

Leslie C. Street has rejoined the **Graton & Knight Company** after serving two years in the U.S. Navy. He returns as supervisor of packing sales. Street joined the company originally in 1949 as supervisor of textile sales.

Edward M. Greer, president and chief engineer of **Greer Hydraulics, Inc.,** has announced the appointment of **Fred W. Gottschling** as director of engineering. In his new position, Gottschling will be in complete charge of the functions of all the engineering departments in the company, responsible to the chief engineer. Gottschling worked for Greer for four years prior to the founding of Greer Hydraulics, Inc. and came to the company very soon after it started. He has been employed in an executive position in the engineering department.

In a trend to wider diversification of the Emsco line of oil field and related products, the addition of a swivel fitting department has been announced by William T. Powell, president. **Emsco Manufacturing Company** acquired the swivel fitting business of the Rasmussen Manufacturing Company of Hollydale, Cal. Heading up the swivel fitting sales program will be **E. R. Atkins.**

Gladden Products Corporation, Glendale, California, recently appointed **Reciputi and Weiss, Inc.,** as their eastern representative. The principals of this firm are **Bruno C. Reciputi** and **Ted Weiss.** Their offices are located at No. 25 John Street, Amityville, L. I., New York.

Gulf States Distributing Co., Houston, Texas, **Robert H. White,** president, was recently named sales representative for Snap-Tite, Inc., Union City, Pa. In October, 1952, White, organized and incorporated Gulf States, a sales organization. Gulf States has an exclusive franchise on Snap-Tite products for the southern part of Texas or the territory south of a line drawn roughly from El Paso to Salina.

The Parker Appliance Co., of Cleveland, Ohio, named six new industrial engineers to their organization and signed distributorship agreements with two firms. **Jack H. Landefeld** of Akron has been assigned the Cleveland-Akron area. He will work with E. W. Hollis of the Cleveland District sales office. Further development of the Texas Gulf Coast area market was assigned to **J. H. Atkinson** of Houston, Texas. Atkinson will work with J. L. Sheehan, with offices in Dallas, Texas. Two appointments were made in the Northern Illinois territory. **W.**

DON'T TAKE CHANCES...

Use Celanese*

LINDOL* HF

the flame-resistant hydraulic fluid

PROVED IN 10 YEARS OF DIE-CASTING APPLICATIONS

- chemically stable
- non-volatile
- odorless
- low pour point
- non-corrosive
- excellent lubricant

Lindol HF—with over 10 years of on-the-job experience—provides an extra margin of safety for operators of hydraulically-activated machines. More and more plant managers today depend on Lindol HF to minimize the hazards of line breaks, leakage caused by vibration, and other mechanical failure.

Developed by Celanese, pioneer in flame-resistant fluids, lubricants, and additives, Lindol HF remains stable at the highest temperatures. It is unaffected by customary thermal and mechanical stresses . . . yields no obnoxious fumes since it contains no chlorine, nitrogen or inorganic salts.

Only minor adjustments, at most, are needed for immediate switchover to Lindol HF—in die-casting equipment, couplings, rams, presses, welding or riveting machines. Write for detailed bulletin.

Celanese Corporation of America
Chemical Division, Dept. 588B
180 Madison Avenue, New York 16, N. Y.

CELANESE* LINDOL* HF

Appearance	Clear
Specific Gravity 20/20° C	1.160 ± .008
Boiling Range @ 10 mm. Hg. °C	255-295
Volatility, 6 hrs. @ 100° C, % max.	0.1
Flash Point, °F Tag open cup	440-465
Fire Point °F Cleveland open cup	685
Auto Ignition Temperature, °F	over 1100
Viscosity Range, Seconds Saybolt Universal @ 25°C	240-325
Pour Point, °C	—25 to —30
Weight, lbs./gal. @ 20° C	9.7

Celanese* CHEMICALS

*Reg. U. S. Pat. Off.

Gordon Jarvis of Rockford took territorial assignment in the Rockford area while **Michael J. McCaughey** was assigned to Chicago. Both will work with E. C. Durfee. **John J. Fegan, Jr.**, of Rochester, N. Y. filled a newly created sales engineer position in the western New York state area. He will work with H. A. Ludlam. Appointed as sales engineer in the Parker aircraft division was **Albert V. Zukas** of Cleveland who will work out of the Cleveland office. A midwest distributor signed for Parker products was the Avels Sales and Engineering Co., 16 West 22nd Street, Indianapolis, Ind. On the West Coast, Bearing Specialty Co. signed distributorship appointments for three California outlets. Locations are at 2928 Poplar St. in Oakland; 790 Brannan St. in San Francisco and 2314 "J" St., Sacramento.

Raymond F. Johnson
Vickers, Inc.

Raymond F. Johnson has recently been assigned to the El Segundo, Cal. office of **Vickers, Inc.** as an application engineer. His prime responsibility will be Boeing Aircraft accounts including Seattle and Wichita. Supplementing this activity he will also handle special assignments in the Los Angeles area. Johnson has been associated with Vickers, Inc. at Detroit for the past thirteen years in various engineering and sales activities. He has most recently been coordinating west coast airframe manufacturers accounts at the Detroit office.

The offices and factory of **Mechanical Air Controls, Inc.**, have moved to a new and larger plant at 10030 Capital, Oak Park, Detroit 37, Mich.

The **American Welding Society** will stage its second Welding and Allied Industry Exposition at the Memorial Auditorium, Buffalo, New York on May 5-7. It has been announced by Joseph G. Magrath, national secretary. The society's National Spring Technical Meeting will be held at the Hotel Statler in the same city, May 4-7. Every type of welding equipment and most accessories will be on display. Exhibits will include equipment for manufacturing and structural purposes, as well as

Equip your valves for
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POWER OPERATION

(Above) High Pressure Gate Valve with Ledeen Valve Actuator.
(Left) Ledeen Tandem Type Valve Actuator on Standard Plug Valve.

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These actuators are for the automatic operation of gate, diaphragm, plug and other line valves, and are pneumatically or hydraulically operated for direct or remote control. Designed as package units, they are mounted directly on the valves without need of special manifolds or outside supports. They are easily, quickly and rigidly installed on new valves or on valves in service.

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PUMPS & BOOSTERS

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for maintenance needs. Considerable emphasis will be placed on welding techniques for the newer metals. Many automatic welding processes also will be featured. In addition to the exhibits and the technical sessions, visitors will be taken on tours of major industrial plants. More than 100 exhibitors are expected and the products of more than 300 companies will be shown.

The appointment of **Andrew A. Johns** as district sales manager for northern California, has been announced by George A. Strever, division sales manager, for Roylyn, Inc. He is well known in industrial circles of northern California which serves him well in the servicing of general industry with Roylyn products. His headquarters are in Orinda, Cal.

Chain Belt Company of Milwaukee, Wisconsin, has purchased a controlling interest in Crothers Engineering Limited and the company will operate as **Canadian Chain Belt Limited.** The company will continue those services formerly supplied by Crothers Engineering Limited. Also, present manufacturing facilities will be expanded for the production of certain chain belt products. A program for the installation of new plant and

L. S. Barksdale, president of Barksdale Valves, has announced that the move of the assembly plant and the general offices to their new address has been completed. These larger facilities are located at the corner of Fruitland and Alcoa, in Los Angeles and were acquired to keep pace with the increasing demand for hydraulic control equipment in the industrial field. A patented principle employed in their manual, as well as their solenoid valves, has brought about fluid controls ranging from vacuum to 6000 psi pressure. In addition, the company manufactures and distributes a complete line of pressure actuated switches to supply the vital link between electric and hydraulic circuits. The models in all lines are now mass produced.

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MULTI-CONTROL VALVE

Capacity 24 GPM
Max. Pressure 1250 PSI
Parallel Application

Model V P

Another Gresen Engineering Triumph In Quality Hydraulics

For Mobile and General Industrial Applications.

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- **Fully Balanced—Self Centering—Built-in Adjustable Relief Valve.**
- **Relief Valve Has Replaceable Hardened Seat**
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- **Check Valve Effective On All Spools**
- **Smooth Positive Easy Control**
- **Hardened and Chrome Plated Spools**
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Center sections are available making additional Controls in this Multi-unit.

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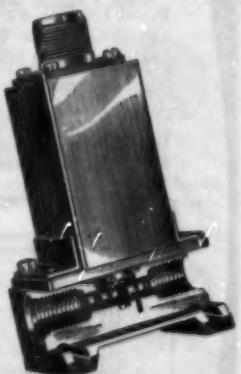
NEW *VALCOR* PRINCIPLE IS SOLVING MORE SOLENOID VALVE PROBLEMS



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***Pat. Pending**

VALCOR
Solenoid Valves

equipment will provide more capacity for welding and metal fabrication.

James-Pond-Clark has announced the appointment of **Charles Fortson** and **James Wilbee** as representatives. Mr. Fortson, representing the San Jose-Fresno area, will make his address at the Power Transmission Supply Company, 337 West Santa Clara Street, San Jose. Mr. Wilbee's offices, representing the northern California-Nevada area will be 420 Market Street, San Francisco. Both are specialists in the field of fluid controls and processing industries.

A. K. Allen Company has appointed **Compressed Air Products Company** of Maplewood as exclusive representatives of their line of cylinders for the state of New Jersey.

Matthew J. Betley
Aeroquip Corp.

Forrest F. Hinkley
Aeroquip Corp.

The appointment of **Matthew J. Betley** as vice president and general manager of **Aeroquip Corporation,** Jackson, Michigan, was announced recently by Peter F. Hurst, president. Betley joined the company in 1952 and was later named vice president of manufacturing. In his new post, he will be responsible for sales, engineering, financial and manufacturing functions, including management of three subsidiaries, Aeroquip, Inc., Aero-Coupling Corp., and Elbeeco, Inc. Announcement has also been made of the appointment of two other officials to new positions. **Forrest F. Hinkley,** who is now director of subsidiary operations and **Horace B. Ferguson** who was named director of purchasing. Hinkley will be responsible for the coordination of sales, engineering, manufacturing and financial functions between Aeroquip and its subsidiaries. Mr. Ferguson replaced Hinkley and will be responsible

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Low Prices
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Measures
8¼" wide x 9⅝" deep.
Boost 100 PSI. air pressure to 10,000 PSI. fluid pressure for $173.25 (FOB Gardena, Calif.). Eight standard models for output fluid pressures of 1,000 to 30,000 PSI. Special models for lower or higher pressures.
Applicable wherever low volume output at high pressures is the requirement. For oil or water service. Complete power packages also available. Send for bulletins.
Assembly No. | Ratio | Maximum Fluid Pressure | Prices, F.O.B. Gardena, Calif.
216-C- 10 | 10:1 | 1,000 PSI. | $220.00
216-C- 20 | 20:1 | 2,000 PSI. | 210.00
216-C- 35 | 35:1 | 3,500 PSI. | 173.25
216-C- 60 | 60:1 | 6,000 PSI. | 173.25
216-C-100 | 100:1 | 10,000 PSI. | 173.25
216-C-150 | 150:1 | 15,000 PSI. | 194.50
216-C-200 | 200:1 | 20,000 PSI. | 225.00
216-C-300 | 300:1 | 30,000 PSI. | 289.50
SPRAGUE
Engineering and Sales Corp.
7144 West 135th Street, Gardena, California

for procurement of materials. He joined the organization last September.

The appointment of **Genn and Logan** as district sales representatives in the Chicago area, has been announced by Lewis L. Dollinger, Jr., sales manager of the **Dollinger Corp.**, Rochester, New York. Earl Genn has been identified with sales engineering activities for a number of years in the midwest. Prior to his association with Mr. Genn, Frederick D. Logan served as mechanical engineer for various firms.

American Metal Products Co., Detroit, Michigan and **Tube Reducing Corp.**, Wallington, New Jersey, have completed preliminary arrangements for a merger of the two firms on a stock basis, according to a joint announcement issued today by Frederick C. Matthaei, president of American Metal Products Co. and John D. Judge, president of Tube Reducing Corp. The merger, already approved by the boards of directors of the two companies, is subject to approval of the stockholders of both companies. The surviving corporation, American Metal Products Co. will continue to operate both businesses with separate corporate identities and with no changes in the present managements.

Rivett Lathe & Grinder, Inc. of Boston, has announced the appointment of **Ficke Engineering & Supply Company**, 305 Pattie Ave., Wichita 7, Kansas, as representative in the Kansas area for the Rivett line of air and hydraulic valves and cylinders and power units.

Carl W. Schwendener has been appointed factory manager of the **Elgin Division** of **Flexonics Corp.** Mr. Schwendener joined the company in 1943 and for the past five years has been personnel director. **Fred A. Abben**, formerly factory manager of the company's Savanna, Illinois Division has been appointed as industrial relations manager. Mr. Abben has assumed the personnel responsibilities formerly carried by Mr. Schwendener. He joined Flexonics Corp. in 1946. A third appointment is that of **Richard Benton** as factory manager at Rock Falls, Illinois.

Lawrence A. Gerber
Honan-Crane Corp.

Bernard J. Hill
Honan-Crane Corp.

The appointment of **Bernard J. Hill**, formerly of the Smith-Dunn Company, to the Sales Engineering staff of the **Honan-Crane Corp.**, Lebanon, Indiana, was announced by D. J. Jones, company manager. Hill will cover Minnesota, North and South Dakota, Iowa, western Wisconsin and the tri-cities area with headquarters in Minneapolis. Also the announcement that **Lawrence A. Gerber** had joined the sales engineering staff was made by Mr. Jones. With headquarters in Dayton, Ohio, Gerber will cover southwestern Ohio, southwestern Indiana and eastern Kentucky. **J. L. Woll** has also joined the sales engineering staff. Woll will work out of Pittsburgh, covering west-

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You can protect threaded and unthreaded openings in a jiffy with these inexpensive plastic plugs and caps. They're easy to apply and easy to remove. Once on — *they stay put.*

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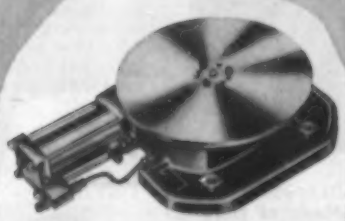

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Post Scripts of Industry

ern Pennsylvania and the Wheeling (W. Va.) area. He is well known in the Pittsburgh area.

Robert E. Tanner was recently elected vice president and general manager of **Carver Pump Company**, Muscatine, Iowa. Mr. Tanner also assumes the post of general sales manager.

The third **Transport Aircraft Hydraulic Conference** took place on November 3 and 4, 1953, at Detroit, Michigan. There were many participants representing 42 industry organizations at this meeting which was sponsored by Vickers Incorporated. 18 airlines (4 foreign) were represented. Two foreign airframe representatives were on hand together with eight representatives of five domestic airframe manufacturers. Howard Pike, chief engineer of National Airlines, acted as general chairman. The conference participants visited the Vickers Laboratory and saw the jet engine simulator in operation. Also viewed was a 70 hp constant speed alternator drive, a plastic cover electrically depressurized variable pump, electro hydraulic servo endurance tests and about thirty other hydraulic application demonstrations.

Sterling Packing & Gasket Company, Inc., of 1703 Nance Street, Houston 1, Texas, has been signed as a distributor of Parker O-Rings according to an announcement from the **Parker Appliance Company** of Cleveland, Ohio. C. L. Fenity, Jr. is vice president and general manager of Sterling and he will be assisted by M. L. Sheehan, Parker representative in the Texas and Southwest district. Parker has also announced the appointment of **Keith R. Detrich** to the newly created position of sales engineer in the territory of Kan-

H-P-M Introduces Component Line

EVER since becoming president of The Hydraulic Press Mfg. Company, Mount Gilead, Ohio, in 1950, John Cotner has sparked the development of a new hydraulic component line. He has seen to it that plant expansion has kept pace with new product development. Today, plant capacity has been more than doubled. The Hydraulic Power Division's plant is devoted exclusively to the mass production of components.

Mr. Cotner has been in the hydraulic field for more than 30 years. He had previously been president of Logansport Machine Company, Inc. and also served as vice president of the Gerotor May Corporation.

Men with impressive performance records in the field of hydraulics have been selected to operate the new Hydraulic Power Division. Working directly with John M. Dolan, vice president and general sales manager are O. Wendell Macy, sales manager, and H. J. Zilske, director of engineering.

Men who helped develop H-P-M's new components are (l. to r.): William H. Bennett, O. Wendell Macy, John C. Cotner, John W. Dolan, and H. J. Zilske.

sas and western Missouri area. In jointly announcing the appointment, D. W. Holmes, vice president in charge of sales, and D. A. Cameron, industrial sales manager at Parker, pointed out that Detrich's addition to the firm's staff is in line with its present policy of expanding its activities in carefully selected areas. Detrich will work with P. E. Walker, Parker representative in the midwestern district.

The Jameson Company of St. Louis has been appointed industrial sales representative of the St. Louis District according to a statement by Carlton H. Winslow, vice president of sales, **Cuno Engineering Corp.** The St. Louis territory includes southern Illinois, all but a portion of western Missouri and small areas of Eastern Kentucky and Tennessee. Mr. Jameson served as technical advisor to the Navy on Cuno filters during the war and since then has been a sales engineer with the home office. Winslow also announced the appointment of **The V. L. Towner Co.** as industrial sales representative of the Cleveland District. Since 1948, Mr. Towner has been assistant general manager of The George P. Dempler Company in Pittsburgh, selling Cuno industrial filters and related products.

John R. Alison, nationally prominent business executive, has been elected administrative vice president of **Northrop Aircraft, Inc.,** by the company's board of directors. Mr. Alison, who assumed his new duties on November 20th, is responsible for administering several Northrop operations, including industrial relations, public relations, flight operations, quality control and Northrop's Anaheim Division at Anaheim, Cal.

W. F. Obear & Son have been appointed western factory sales representatives for the Quijada Tool Division of Gaines-Collins, Los Angeles. They will cover the 11 western states and El Paso area. Los Angeles headquarters are located at 6075 S. Normandie Avenue.

Richard T. Burke, a sales engineer, has been added to the Houston staff of **Tube Turns, Inc.** Other appointments by Tube Turns, assigned **Earl R. Muir, Sr.,** a sales engineer, to Seattle and **Bert Grant** to the Pittsburgh office and **Clyde Chronister** to the Tulsa office.

Titeflex, Inc., of Newark, New Jersey, announces that it has opened a new sales office for the state of Michigan at room 641, Book Building, 1249 Washington Blvd., Detroit 26, Michigan. In charge of the office will be sales representative **Edward Frank.** Titeflex, Inc. also announced the appointment of **Arthur M. Rogers** as controller of the company. Rogers started with the Indian Motorcycle Company as head of the legal department. Upon the merger of the motorcycle company with the Titeflex company, Rogers was made secretary and assistant

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A NEW 3/4" NEEDLE VALVE

- **Accurate flow control — holds adjustment**
- **Leakproof, maintenance-free service**
- **Low cost**

- **For Oil or Gasoline**
- **Copper-Brazed Steel Body**
- **For 3000 P. S. I.**
- **Also available in ¼", ⅜" and ½" pipe sizes**

Write for detailed engineering data and prices.

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Relief Valves • Check Valves • Restrictor Valves • Needle Valves • Pilot Check Valves • Clamping Valves • Small Spring Loaded Accumulators • Special Valves

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SEND your specifications for hydraulic cylinders to American, specialists in hollow boring and honing. We manufacture from tubing or forgings in carbon or alloy steels up to 15" I.D. Over 40 years experience backed by precision machines and skilled craftsmen will save you time and money. Send your blueprints.

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treasurer of the combined company. The manufacturing facilities of Titeflex consist of two plants in Newark, New Jersey and one in Springfield, Mass. Rogers' time will be divided between the two offices.

E. C. Sulzman, vice president, Jack & Heintz, announces the appointment of **Sidney H. Webster** as manager of the **Northeastern District, Jack Heintz,** with headquarters at 11 West 42nd Street, New York 18, N. Y.

Peter A. Frasse and Co., Inc., has opened a new plant at Locust St. (off Airport Road), Hartford, Connecticut.

Earl D. Hilburn will join the headquarters staff of **Westinghouse Air Brake Company** in the newly created office of vice-president, Government Contract Service. In his new capacity, Hilburn will coordinate the efforts of all

YES GAST customers HELP US... TO HELP YOU!

THEY DO IT WITH PERSONAL RECOMMENDATIONS! Recently we surveyed our new accounts (whose engineers specified Gast Air Motors, Compressors and Vacuum Pumps as components for their products).
Of these new accounts, we found that *one-half* were sent to us by other satisfied Gast customers! Also, a sampling from hundreds of accounts indicates on average O.E.M. customer has bought from Gast for 16½ years!

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Write GAST describing your specific application. Request Catalog and "Ideas" booklet.

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GAST ROTARY — AIR MOTORS • COMPRESSORS • VACUUM PUMPS
(TO THREE H.P.) (TO 30 CFM.) (TO 28 INCHES)
GAST MANUFACTURING CORP., Hinkley St., Benton Harbor, Mich.

SAVE UP TO 85% ON GOVERNMENT SURPLUS
MAGNI-FOCUSER
Has fine ground lenses of optical glass. Neutralizes eye strain from close work. Binocular design gives third dimensional vision. Allows freedom of both hands. Wear over glasses. Plastic frame with adjustable headband.
SIZES: 20" focal lgth. 1½ power — 14" focal lgth., 1¾ power, 10" focal lgth., 2½ power; 8" focal lgth., 3½ power ..... price each ONLY 10.50
HYDRAULIC EQUIPMENT
We stock over 100,000 Hydraulic Cylinders in 106 different types and sizes. These can be adapted wherever tremendous power is needed to push, pull, hoist, mould or drive, etc.
SPECIAL
Gives 30,000 lb. thrust using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 2000 PSI. Can also be used on a low pressure air system. Has 4" bore; 18" stroke; 3015" long. Ideal for shop. Part No. 29 NOW 43.95 SALE 29.95
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See our complete line. Pullers for Gears, Bearings, Wheels, Pulleys, Bushings, Shafts, etc.
NEW 10 TON HYDRAULIC PRESS
Use this Press in the Shop or take it with you on the job. Frame is 4" welded channel iron. Has 6½" stroke, 2½" diam. ram. Valve operates piston in both directions. Adjustable platform. Positive power Hand Pump with handle. 2000 PSI pressure gauge. 129.00
SIZE: 68" high, 27" wide, 29" base
HYDRAULIC HAND PUMP
Operating pressure 1500 PSI. Cap., 1.5 cu. in per complete cycle ... 12.75
ACCUMULATORS
A-2B FLOATING PISTON TYPE — 4" x 18" Built to stand 2,000 PSI 12.75
A-5 VICKERS — 10" dia. Ball type. Built to stand 2000 P.S.I. 24.50
NOTE: Stocks include bargains in Hydraulic Pumps — Valves — Motors — Boosters — as well as Oil, Water and Fuel Pumps, etc.
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Circle 61 on Reader Service Card

Westinghouse Air Brake's Divisions with respect to the procurement and execution of contracts for the armed forces and government agencies.

Servomechanisms, Inc., with three divisions in the United States, has recently acquired a wholly owned subsidiary, **Industrial Electronics of Canada, Ltd.** The new subsidiary company will continue to operate under its own name. **Alexander S. Mackie** will continue as president of this company as will **Donald L. Stewart** as treasurer with the added duties of secretary.

The appointment of **James S. Anderson** as general sales manager of the **Tubular Products Division** of **The Babcock & Wilcox Company** was announced by William J. Thomas, general manager. He has been associated with Babcock & Wilcox since September, 1941, when he was named a district salesman in the Tubular Products Division's New York sales office. He was named assistant manager of the New York District's sales office in 1944 and assistant general sales manager of the division in December 1948. Another recent appointment at the Tubular Products Division is that of **Robert E. Halloran** to the newly created position of manager of mechanical sales.

John R. Hamill has been appointed manager of the Kansas City District office of **Worthington Corp.** according to an announcement by T. J. Kehane assistant vice president and general sales manager. He will succeed **Paul J. Foley** who has been appointed general sales manager for Worthington's Plainfield (N. J.) Work's products.

Philadelphia Group to Hear Robinson

James Robinson, chief engineer, Vickers, Inc., Detroit, Mich., will be the speaker at the February 17th meeting of the Philadelphia Section, Fluid Power Systems Division, American Society of Mechanical Engineers, at the University of Pennsylvania Engineering Building. Mr. Robinson will speak on "Basic Hydraulics and Circuits". Robinson, a veteran with the Vickers organization is particularly qualified to review the basic principles of applying fluid power equipment in a manner that will be interesting and instructive for the old timer and understandable by an ambitious student of the art.

The meetings of this group, under the chairmanship of J. S. Bennett, Vice President, American Engineering Company, have drawn large attendances from the Greater Philadelphia area.

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Get Air that's Specially
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Post Scripts of Industry

Construction of a new plant for the fabrication of precision silicone parts is under way adjacent to the main plant of **Goshen Rubber Co., Inc.**, at Goshen, Ind. Facilities and departments in the new plant include presses, mills, extruders, curing ovens and trimming. Completion is expected during the first quarter of the new year.

Appointment of **Thomas K. Wells** as general manager of **Flexonics Corp.**, Maywood, Illinois, has been announced by John F. P. Farrar, president. Wells has been with the company twelve years and was most recently sales manager for the Bellows and Aircraft Divisions.

Early in January, **Hose Accessories Co.** announced the following promotions. **A. T. Dewees** formerly sales manager of the Le-Hi Division of Hose Accessories Co. has been appointed sales promotion and advertising manager of both the Le-Hi and Champ Divisions. **Fred Starr** has been appointed general sales manager for all products manufactured by both divisions of the company.

Election of **Frederick O. Detweiler** as president of **Chance Vought Aircraft, Incorporated**, was announced early in January. Detweiler has been general manager of Chance Vought Aircraft Division, United Aircraft Corporation. Under terms of a recently announced plan, however, Chance Vought is separating from United Aircraft and, during this year, will become a completely independent corporation. Other officers elected are: **Admiral H. B. Sallada**, USN (Ret.), vice president; **N. V. Turney**, controller; **B. W. Whitten**, treasurer; and **J. J. Gaffney**, secretary. Appointed officers of the new corporation are: **W. C. Copp**, assistant treasurer and assistant secretary; **F. D. Reynolds**, auditor; **H. R. Eshenfelder**, chief accountant; **H. E. Kay**, assistant secretary.

William J. Klein manager of Minneapolis branch, Tractor Division, **Allis-Chalmers Co.**, Milwaukee, has been named vice president and general sales manager of the Tractor Division.

Marking the beginning of an $8,000,000 industrial development for Orange County, California, ground was broken December 18 on the 89 acre site of **U. S. Electrical Motors Inc.** on Santa Ana Freeway in the city of Anaheim. More than 100 top officials of Orange County cities and industries gathered on the plant site to witness lifting of the first shovelful of earth by **George T. Pfleger**, president. He was assisted by Mayor Charles Pearson of Anaheim and **Thomas G. Meyers**, vice president of U. S. Motors.

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VALVES
INDUSTRIAL · CHEMICAL · AIRCRAFT

FREE-FLOW CHECK VALVE

- Very low pressure drop
- Leakproof "O" ring seal
- ¼ psi Opening pressure
- 0 to 3000 psi service
- Small in size
- Aluminum alloy, brass—Other materials to order
- Sizes ⅛" to 1"
- Any combination of tube and pipe ports.

Write for complete catalog and nearest distributor.

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EQUIPMENT LASTS LONGER
...PERFORMS BETTER...
when the
ARIDIFIER
SCRUBS, CLEANS AND DRIES
On Air and Gas Lines

LASTS LONGER because...
The Aridifier's patented centrifugal-baffle action traps 92% of all dirt, oil, scale and water in gas or compressed air . . . and drains off these troublemakers *before* they can damage tools and equipment.

PERFORMS BETTER because...
The Aridifier protects tools against the freezing, fouling, caking and corrosion caused by dirt and foreign matter . . . assures the clean, dry air and gas that means better spray work, painting, lacquering, sand blasting, air cleaning, and similar operations.

Easily installed, the Aridifier maintains itself. 10 models. Capacity range: 7 CFM to 17,000 CFM.

Learn HOW the Aridifier scrubs with a patented centrifugal-baffle action.
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Circle 72 on Reader Service Card

Circle 51 on Reader Service Card

How to Prepare Circuits to Use Water-Base Nonflammable Fluids

SUCCESSFUL application of new water base fluids requires proper preparation of the system before filling, and a program for checking the condition of the fluid periodically. Actually a hydraulic system using any type of fluid requires the same kind of care for efficient operation.

Because of the fire hazard existing near many hydraulic machines, plant men are taking an increased interest in using nonflammable fluids. A nonflammable fluid should not only be safe from the standpoint of fire resistance. It must be safe also for the machine itself. It must be non-toxic, non-corrosive, safe for packings, high in viscosity index (must not thin out or thicken with temperature change), stable, and high in lubricating properties.

As a result of extensive field testing of water-base fluids much has been learned regarding their use. This includes how to clean machines prior to installation, keeping up the water content, checking viscosity and pH, and other service points.

One user, who had painted the inside of reservoirs using petroleum base fluids with red enamel, found that this paint had to be stripped completely before use of a water-base fluid. Proper cleaning of the tank and piping is important. Here is a procedure for readying the circuit to use water-base fluids.

1. Drain machine completely.
2. Wipe out any accumulated sludge deposits from the reservoir.
3. Fill the system with a flushing compound which will protect against rusting of metal parts, and will provide lubricity during flushing run.
4. Set the relief valve at 50 psi pressure, and cycle the machine for about five minutes.
5. Remove flushing solution from reservoir and, if possible, break lines at points where fluid may remain in pockets and drain it thoroughly.
6. Wipe reservoir dry with lint-free cloth.
7. Clean filter or install new element. Fuller's earth or similar diatomaceous earth type filters are not recommended for water-base fluids.
8. Add the new fluid to system.
9. If, after running and following a period of rest, a separation is noted in the reservoir contents, the foreign material should be removed at intervals until completely gone. Depending upon its gravity, this material will either be on the surface, as in the case of petroleum oil, or if a heavier fluid was formerly used, it will drop to the bottom. In the former case it may be skimmed off, while in the latter it can be removed with a suction gun.

Periodic Check of Water Content

After 48 hours of operation, samples should be removed for visual inspection as well as viscosity and pH determinations.

Since a water-base fluid depends for its nonflammability largely on

Sonnet's NEW Port Contour Cutter Produces the A.N.D. 10050 hydraulic port contour IN ONE PASS!

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the water content, it is necessary to check the viscosity periodically (depending on sump temperature) and add water, the amount being based on the increase in viscosity which has occurred. Due to water evaporation, fluid viscosity may increase from an initial of 200 S.U.S. to more than 250 S.U.S. Either distilled or de-ionized water, such as boiler feed water, should be used. The addition of tap water is discouraged because of its possible hardness.

Maintaining pH Value

A further check on the fluid is obtained from regular pH readings. The pH value should be maintained at a value recommended by the fluid producer. The value indicates the adequacy of certain ingredients in the fluid which impart its unique qualities. A variation beyond or below the recommended value would be a sign of deterioration. You can check pH value periodically by using Hydrion papers, available from any chemical supply house.

This article has been prepared from material in E. F. Houghton & Company's Service Bulletin No. 16.

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NEW MINIATURE PRECISION HYDRAULIC VALVE

Skinner's new V10 Series Miniature Hydraulic Valve is an amazingly compact unit, capable of handling pressures up to 1000 P.S.I.

This precision-made valve is ideally fitted for use in the automatic operation of single and double acting hydraulic cylinders, and in pilot control of larger three and four way hydraulic valves.

The V10's construction is consistent with the Skinner quality tradition: most internal parts are of stainless steel; the slide mechanism has a precision-ground piston, and a bore honed to extremely close tolerance, thus minimizing leakage.

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The economical design and unusually small size of the Skinner Miniature Hydraulic V10 valve will enable many manufacturers to install it in places where, heretofore, remote control devices have been considered impractical. *Write for Bulletin 529.*

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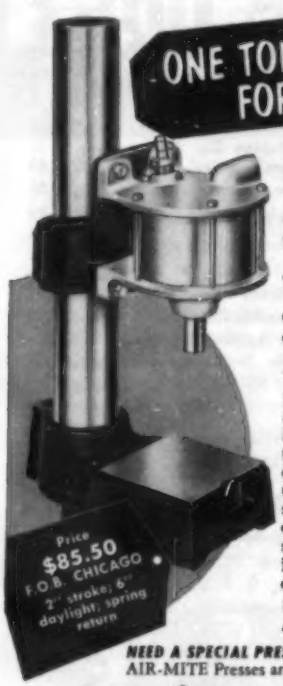

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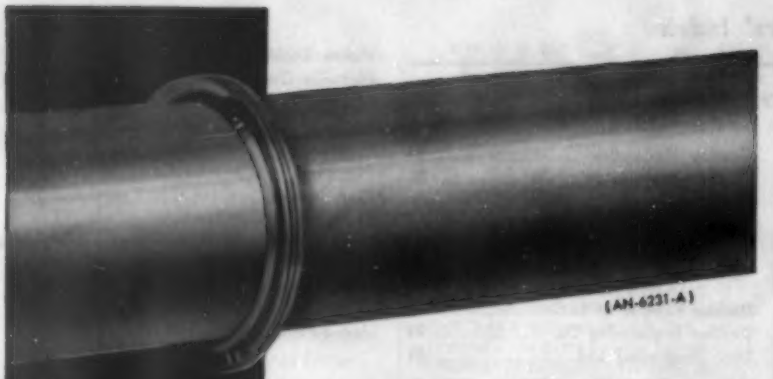

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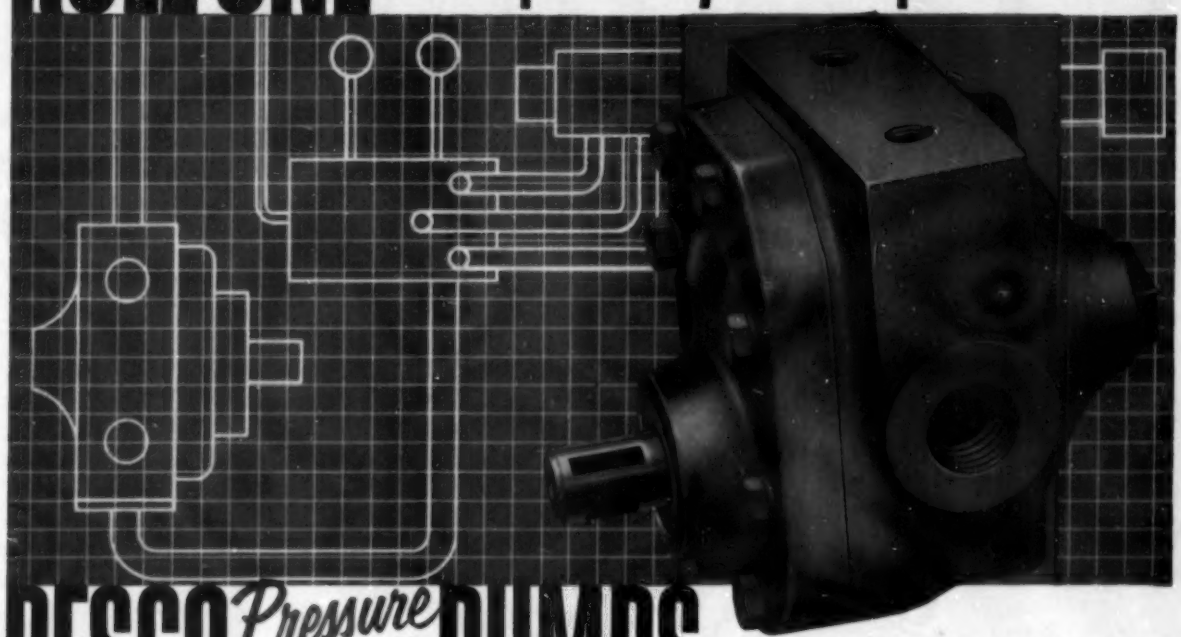

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APPLIED HYDRAULICS

This issue will feature a group of articles on the general theme, "How to Use Fluid Power for Better Tooling." These articles have been specially prepared for the men who design, sell, operate and maintain hydraulic and pneumatic components, circuits and systems.

The 1954 Industrial Exposition of the American Society of Tool Engineers will be held at Convention Center in Philadelphia, April 24 to 30 inclusive. Go if you can.

The bi-annual A.S.T.E. Industrial Exposition is the largest Show devoted to standard and special machines, production and toolroom components and accessories, equipment and services basic to the manufacturing and assembly production industries. An important segment of the Show will be the large number of exhibits of hydraulic and pneumatic units, shown both as separate components and as functional parts of live, operating exhibits.

Exhibitors include representative hydraulic and pneumatic equipment manufacturers and a cross section of the blue-ribbon manufacturers and suppliers of America's production tooling.

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